Title 51 WAC
BUILDING CODE COUNCIL

Chapters

DISPOSITION OF CHAPTERS FORMERLY CODIFIED IN THIS TITLE

Chapter 51-10
BARRIER-FREE FACILITIES

51-10 Barrier-free facilities [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW and 1989 c 266. 90-02-110, filed 1/3/90, effective 7/1/90. Statutory Authority: Chapters 19.27 and 70.92 RCW. 88-24-021 (Order 88-09), filed 12/2/88, effective 7/1/89; 86-24-040 (Order 86-18), filed 11/26/86, effective 4/27/87; 85-07-036 (Order 85-02), filed 3/18/85; 85-03-095 (Order 85-01), filed 1/22/85; 83-15-033 (Order 83-4), filed 7/18/83; Order 77-02, filed 8/3/77; Order 76-02, filed 9/1/76; Order 76-01, filed 6/28/76.] Repealed by 92-01-130, filed 12/19/91, effective 7/1/92. Statutory Authority: Chapters 70.92 and 19.27 RCW.

Chapter 51-12
WASHINGTON STATE ENERGY CODE

51-12-100 Section 100. Title. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-100, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-101 Section 101. Intent. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-101, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-102 Section 102. Scope. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-102, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-102, filed 9/23/86; 86-11-013 (Order 86-04), § 51-12-102, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-102, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-103 Section 103. Conflicts with other codes. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-103, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-104 Section 104. Materials and equipment. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-104, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-105 Section 105. Alternate materials—Method of construction, design or insulating systems. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-105, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-106 Section 106. Plans and specifications. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-106, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-107 Section 107. Inspections and enforcement. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-107, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-108 Section 108. Severability. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-108, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-109 Section 109. Violations. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-109, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-110 Section 110. Liability. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-110, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-200 Section 200. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-200, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-201 Section 201. A. [Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-201, filed 9/23/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-201, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-202 Section 202. B. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-202, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-203 Section 203. C. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-203, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-204 Section 204. D. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-204, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-205 Section 205. E. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-205, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-206 Section 206. F. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-206, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-206, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-207 Section 207. G. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-207, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-208 Section 208. H. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-208, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-209 Section 209. I. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-209, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-210 Section 210. J. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-210, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-211 Section 211. K. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-211, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-212 Section 212. L. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-212, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-213 Section 213. M. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-213, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-214 Section 214. N. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-214, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-215 Section 215. O. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-215, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-216 Section 216. P. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-216, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-217 Section 217. Q. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-217, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-218 Section 218. R. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-218, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-219 Section 219. S. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-219, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-219, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-220 Section 220. T. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-220, filed 1/3/90, effective 7/1/90. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-220, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-221 Section 221. U. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-221, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-222 Section 222. V. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-222, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-223 Section 223. W X Y Z. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-223, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-223, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-300 Section 300. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-300, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-301 Section 301. Heated and cooled buildings. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-301, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-302 Section 302. Climatic Zones. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-302, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-303 Section 303. Departures. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-303, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-304 Section 304. Design parameters. [Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-304, filed 9/23/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-304, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-305 Section 305. Ventilation. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-305, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-305, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-400 Section 400. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-400, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-401 Section 401. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-401, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-402 Section 402. Overall thermal performance and building envelope requirements. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-402, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-402, filed 9/23/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-402, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-403 Section 403. Thermal performance criteria and envelope requirements for low-rise residential buildings. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-403, filed 1/3/90, effective 7/1/90. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-403, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-404 Section 404. Thermal performance criteria for all other occupancies. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-404, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-11-013 (Order 86-04), § 51-12-404, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-404, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-405 Section 405. Air leakage for all buildings. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-405, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-406 Section 406. Building mechanical systems. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-406, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-407 Section 407. Calculations of heating and cooling loads and system sizing limits. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-407, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-408 Section 408. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-408, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-409 Section 409. Simultaneous heating and cooling. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-409, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-410 Section 410. Energy recovery. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-410, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-411 Section 411. HVAC equipment performance requirements. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-411, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-11-013 (Order 86-04), § 51-12-411, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-411, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-412 Section 412. Energy for air delivery. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-412, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-413 Section 413. Balancing. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-413, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-414 Section 414. Cooling with outdoor air (economizer cycle). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-414, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-415 Section 415. Controls. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-415, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-416 Section 416. Air handling duct system insulation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-416, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-417 Section 417. Duct construction. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-417, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-418 Section 418. Piping insulation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-418, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-419 Section 419. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-419, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-420 Section 420. Water heaters, storage tanks, boilers, and piping. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-420, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-421 Section 421. Pump operation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-421, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-422 Section 422. Pipe insulation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-422, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-423 Section 423. Conservation of hot water. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-423, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-424 Section 424. Electrical power and lighting. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-424, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-425 Section 425. Lighting switching. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-425, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-426 Section 426. Lighting power budget. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-426, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-426, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-426, filed 9/23/86; 86-11-013 (Order 86-04), § 51-12-426, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-426, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-500 Section 500. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-500, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-501 Section 501. Energy analysis. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-501, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-502 Section 502. Design. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-502, filed 11/26/85.]

Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-503 Section 503. Analysis procedure. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-503, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-503, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-504 Section 504. Calculation procedure. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-504, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-505 Section 505. Documentation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-505, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-506 Section 506. Buildings utilizing nondepletable energy. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-506, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-507 Section 507. Documentation—buildings using nondepletable energy sources. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-507, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-600 Section 600. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-600, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-601 Section 601. Low-rise residential building envelope requirements. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-601, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-601, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-601, filed 9/23/86; 86-11-013 (Order 86-04), § 51-12-601, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-601, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-602 Section 602. Low-rise residential building mechanical systems. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-602, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-11-013 (Order 86-04), § 51-12-602, filed 5/13/86; 85-24-028 (Order 85-14), § 51-12-602, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-603 Section 603. Low-rise residential building service water heating. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-603, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-604 Section 604. Low-rise residential building electrical power and lighting. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-604, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-605 Section 605. Building envelope requirements for other than low-rise residential buildings. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-605, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-605, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-606 Section 606. Building mechanical systems requirements for other than low-rise residential buildings. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-606, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-607 Section 607. Service water heating requirement for other than low-rise residential buildings. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-607, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

51-12-608 Section 608. Electrical power and lighting requirements for other than low-rise residential buildings. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-608, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-608, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-11-013 (Order 86-04), § 51-12-608, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-608, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

Chapter 51-18
WASHINGTON STATE WATER CONSERVATION PERFORMANCE STANDARDS

51-18-010 Declaration of purpose. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-010, filed 1/3/90, effective 7/1/90.] Repealed by 92-01-068, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.170 and chapter 19.27 RCW.

51-18-020 Application. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-020, filed 1/3/90, effective 7/1/90.] Repealed by 92-01-068, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.170 and chapter 19.27 RCW.

51-18-030 Water efficiency standards. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-030, filed 1/3/90, effective 7/1/90.] Repealed by 92-01-068, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.170 and chapter 19.27 RCW.

51-18-040 Exceptions. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-040, filed 1/3/90, effective 7/1/90.] Repealed by 92-01-068, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.170 and chapter 19.27 RCW.

51-18-050 Implementation. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-050, filed 1/3/90, effective 7/1/90.] Repealed by 92-01-068, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.170 and chapter 19.27 RCW.

Chapter 51-20
STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1991 EDITION OF THE UNIFORM BUILDING CODE (Replaced by chapter 51-30 WAC)

51-20-001 Authority. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-001, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-002 Purpose. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-002, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-003 Uniform Building Code. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-003, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-004 Conflicts with Washington State Ventilation and Indoor Air Quality Code. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-004, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-005 Uniform Building Code requirements for barrier-free accessibility. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-005, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-007 Exceptions. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-007, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-008 Implementation. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-008, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-009 Recyclable materials and solid waste storage. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-009, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0100 Chapter 1. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0100, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0104 Application to existing buildings and structures. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0104, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0300 Chapter 3. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0300, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0307 Structural observation. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0307, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0400 Chapter 4. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0400, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0404 Section 404. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0404, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0407 Section 407. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0407, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0409 Section 409. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0409, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0414 Section 414. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0414, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0417 Section 417. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0417, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0420 Section 420. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0420, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0500 Chapter 5. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0500, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0503 Mixed occupancy. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0503, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0514 Heating. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0514, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0515 Solid fuel burning devices. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0515, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0551 Table No. 5-B—Required separation in buildings of mixed occupancy. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0551, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0600 Chapter 6. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0600, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0605 Light, ventilation and sanitation. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0605, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0700 Chapter 7. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0700, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0702 Construction, height and allowable area. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0702, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0800 Chapter 8. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0800, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0801 Group E Occupancies defined. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0801, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0802 Construction, height and allowable area. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0802, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0900 Chapter 9. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0900, filed 12/19/91,

effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0901 Group H Occupancies defined. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0901, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-0902 Construction, height and allowable area. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-0902, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1000 Chapter 10. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1000, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1011 Suite concept. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1011, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1200 Chapter 12. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1200, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1201 Group R Occupancies defined. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1201, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1210 Smoke detectors and sprinkler systems. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1210, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1215 Family child day care homes. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1215, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1223 Division II. Requirements for Group R, Division 4 and Division 5 Occupancies. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1223, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1224 Construction, height and allowable area. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1224, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1225 Location on property. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1225, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1226 Exits and emergency escapes. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1226, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1227 Light, ventilation and sanitation. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1227, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1228 Yards and courts. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1228, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1229 Room dimensions. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1229, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1230 Section 1230. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1230, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1231 Shaft enclosures. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1231, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1232 Fire alarm systems. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1232, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1233 Heating. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1233, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1234 Special hazards. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1234, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1800 Chapter 18. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1800, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-1807 Special provisions for Group B, Division 2 office buildings and Group R, Division 1 Occupancies. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-1807, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-2300 General design requirements. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-2300, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-2312 Definitions for wind design. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-2312, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-2700 Chapter 27. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-2700, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-2710 Steel structures resisting forces induced by earthquake motions in Seismic Zones Nos. 3 and 4. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-2710, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3000 Chapter 30—Veneer. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3000, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed

5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3007 Plastic veneer. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3007, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3100 Chapter 31—Accessibility. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3100, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3101 Scope. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3101, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3102 Definitions. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3102, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3102, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3103 Building accessibility. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3103, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3103, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3104 Egress and areas for evacuation assistance. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3104, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3104, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3105 Facility accessibility. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3105, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3105, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3106 Section 3106. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3106, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3106, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3107 Parking facilities. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3107, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3107, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3108 Passenger loading zones. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3108, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3108, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3109 Scope. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3109, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3109, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3110 Definitions. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3110, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3110, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3111 Additions. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3111, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3111, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3112 Alterations. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3112, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3112, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3113 Historic preservation. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3113, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3113, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3114 Appeal. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-3114, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3114, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3151 Section 3151. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3151, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3152 Section 3152. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3152, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3153 Section 3153. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3153, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3154 Section 3154. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3154, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3155 Section 3155. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3155, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3156 Section 3156. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3156, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3300 Chapter 33. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3300, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3304 Doors. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3304, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3306 Stairways. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3306, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3315 Aisles. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3315, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3350 Section 3350. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3350, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3800 Chapter 38. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3800, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3801 Scope. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3801, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3802 Automatic fire-extinguishing systems. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3802, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3900 Chapter 39. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3900, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3901 Scope. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3901, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-3903 Stages. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-3903, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-5100 Chapter 51. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-5100, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-5103 Delete section 5103, special provisions. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-5103, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-5105 Elevator machine room floors. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-5105, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-5400 Chapter 54. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-5400, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-5401 Scope. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-5401, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-93100 Appendix chapter 31. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-93100, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-93115 Section 3115. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-93115, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-93116 Section 3116. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-93116, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-93117 Section 3117. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-93117, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-93118 Section 3118. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-93118, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-93119 Section 3119. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-93119, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-93119, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-20-93120 Section 3120. [Statutory Authority: RCW 19.27.074 and 70.92.140. 93-01-166, § 51-20-93120, filed 12/23/92, effective 7/1/93. Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-20-93120, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

Chapter 51-21
STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1991 EDITION OF THE UNIFORM BUILDING CODE STANDARDS
(Replaced by chapter 51-30 WAC)

51-21-001 Authority. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-001, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-21-002 Purpose. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-002, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-21-003 Uniform Building Code standards. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-003, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-21-007 Exceptions. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-007, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-21-008 Implementation. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-008, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-21-31010 UBC Standards No. 31-1. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-31010, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-21-38030 UBC Standards No. 38-3. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-38030, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed

5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-21-38038 Table 1-5.1. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-38038, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-21-38039 Table 1-5.5. [Statutory Authority: Chapters 70.92 and 19.27 RCW. 92-01-145, § 51-21-38039, filed 12/19/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

Chapter 51-22
STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1991 EDITION OF THE UNIFORM MECHANICAL CODE
(Replaced by chapter 51-32 WAC)

51-22-001 Authority. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-001, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-002 Purpose. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-002, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-003 Uniform Mechanical Code. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-003, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-004 Conflict between Uniform Mechanical Code and State Energy Code chapter 51-11 WAC. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-004, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-005 Conflict between Uniform Mechanical Code and State Ventilation and Indoor Air Quality Code chapter 51-13 WAC. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-005, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-007 Exceptions. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-007, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-008 Implementation. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-008, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-0400 Chapter 4—Definitions and abbreviations. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-0400, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-0423 U. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-0423, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-0500 Chapter 5—Equipment—General. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-0500, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-0504 Installation. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-0504, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-0800 Chapter 8—Vented decorative appliances, floor furnaces, vented wall furnaces, unit heaters and room heaters. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-0800, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-0807 Room heaters. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-0807, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-1000 Chapter 10—Ducts. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-1000, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-1002 Material. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-1002, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-1100 Chapter 11—Ventilation systems and product-conveying systems. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-1100, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-1104 Environmental air ducts. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-1104, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-1500 Chapter 15—Mechanical refrigerating equipment. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-1500, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-1508 Refrigeration machinery room ventilation. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-1508, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-1900 Chapter 19—Miscellaneous heat-producing appliances. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-1900, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95,

effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-22-1903 Clothes dryers. [Statutory Authority: RCW 19.27.074, 19.27.031, 19.27A.070 through 19.27A.100, and chapters 19.27 and 19.27A RCW. 92-01-064, § 51-22-1903, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

Chapter 51-24
STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1991 EDITION OF THE UNIFORM FIRE CODE
(Replaced by chapter 51-34 WAC)

51-24-001 Authority. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-001, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-002 Purpose. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-002, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-003 Uniform Fire Code. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-003, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-007 Exceptions. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-007, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-008 Implementation. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-008, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-04000 Article 4. Permits. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-04000, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-04123 Table No. 4.108-C, Permit amounts for hazardous materials. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-04123, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-09000 Article 9. Definitions and abbreviations. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-09000, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-09105 Section 9.105. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-09105, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-09107 Section 9.107. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-09107, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-09110 Section 9.110. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-09110, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-09117 Section 9.117. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-09117, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-10000 Article 10. Fire protection. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-10000, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-10201 Section 10.201. General. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-10201, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-10507 Required installations of automatic fire-extinguishing systems. Section 10.507. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-10507, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-25000 Article 25. Places of assembly. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-25000, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-25107 Aisles. Section 25.107. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-25107, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-45000 Article 45. Application of flammable finishes. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-45000, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-45211 Drying apparatus. Section 45.211. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-45211, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-78000 Article 78. [Statutory Authority: Chapter 19.27 RCW. 93-01-162, § 51-24-78000, filed 12/23/92, effective 7/1/93.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-78201 General. [Statutory Authority: Chapter 19.27 RCW. 93-01-162, § 51-24-78201, filed 12/23/92, effective 7/1/93.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-79000 Article 79. Flammable and combustible liquids. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-79000, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-79601 General. Section 79.601. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-79601, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-79603 Corrosion protection. Section 79.603. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW.

92-01-065, § 51-24-79603, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-79809 Unloading operations. Sec. 79.809. [Statutory Authority: RCW 19.27.074. 93-01-163, § 51-24-79809, filed 12/23/92, effective 7/1/93.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-79901 General. Section 79.901. [Statutory Authority: RCW 19.27.074. 93-01-163, § 51-24-79901, filed 12/23/92, effective 7/1/93.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80000 Article 80. Hazardous materials. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80000, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80101 Scope. Section 80.101. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80101, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80103 Permits. Section 80.103. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80103, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80108 Construction requirements. Section 80.108. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80108, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80109 Personnel training and written procedures. Section 80.109. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80109, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80110 Section 80.110. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80110, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80111 Section 80.111. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80111, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80113 Section 80.113. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80113, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80114 Section 80.114. Section 80.114. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80114, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80120 Table No. 80.112-A. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80120, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80202 Hazard categories. Section 80.202. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80202, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80301 General. Section 80.301. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80301, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80303 Toxic and highly toxic compressed gases. Section 80.303. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80303, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80305 Flammable solids and combustible dusts. Section 80.305. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80305, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80315 Delete section 80.315 Carcinogens, irritants, sensitizers and other health hazard solids, liquids and gases entirely. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80315, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80401 Section 80.401. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80401, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-80402 Dispensing and use. Section 80.402. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-80402, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-99500 Division V. Standards. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-99500, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-24-99510 Appendix V-A. Nationally recognized standards of good practice. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-24-99510, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

Chapter 51-25
STATE BUILDING CODE ADOPTION OF THE 1991 EDITION OF THE UNIFORM FIRE CODE STANDARDS
(Replaced by chapter 51-35 WAC)

51-25-001 Authority. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-25-001, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-25-002 Purpose. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-25-002, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-25-003 Uniform Fire Code standards. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-25-003, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory

Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-25-007 Exceptions. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-25-007, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

51-25-008 Implementation. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-065, § 51-25-008, filed 12/13/91, effective 7/1/92.] Repealed by 95-11-107, filed 5/23/95, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.020, 19.27.031 and chapter 34.05 RCW.

Chapter 51-04 WAC

POLICIES AND PROCEDURES FOR CONSIDERATION OF STATE-WIDE AND LOCAL AMENDMENTS TO THE STATE BUILDING CODE

WAC

WAC 51-04-010 Declaration of purpose. The Washington state building code council, hereinafter called the council, is required by chapter 266, Laws of 1988, to adopt and maintain the state building code, hereinafter referred to as the building code, as provided in chapters 19.27, 19.27A, and 70.92 RCW, and the state legislature.

The primary objective of the council is to encourage consistency in the building code throughout the state of Washington and to maintain the building code consistent with the state's interest as provided in RCW 19.27.020.

The building code shall be as defined in WAC 51-04-015(6).

The council is also required by RCW 19.27.074 to approve or deny all city and county amendments to the building code that apply to single family or multifamily buildings as defined in RCW 19.27.015.

The purpose of this chapter is to establish policies and procedures for submittal and council review and consideration of proposed state-wide and city and county amendments respectively, to the building code.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-010, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-04-010, filed 9/1/76.]

WAC 51-04-015 Definitions. (1) "Supplements and accumulative supplements" mean the publications between editions of the uniform codes and standards which include changes to the current edition of the uniform codes and standards.

(2) "Council" means the Washington state building code council.

(3) "Emergency state-wide amendment" means any proposed state-wide amendment, the adoption of which is necessary immediately in order to protect life, safety or health of building occupants; preserve the structural integrity of buildings built to the state building code; to correct errors and omissions; or by the direction of the Washington state legislature or federal legislation. Emergency state-wide amendments to the state building code must be adopted in accordance with the Administrative Procedure Act, chapter 34.05 RCW.

(4) "Local government amendment" means any amendment to the state building code, as adopted by cities or counties for implementation and enforcement in their respective jurisdictions.

(5) "Local government residential amendment" means any amendment to the state building code, as adopted by cities or counties for implementation and enforcement in their respective jurisdictions, that applies to single and multifamily buildings as defined by RCW 19.27.015.

(6) "State building code" means the Uniform Building Code and Standards; the Uniform Mechanical Code including Appendix B, Chapter 22 Fuel Gas Piping; the Uniform Fire Code and Standards; the Uniform Plumbing Code and Standards, excluding Chapters 11 and 12; the state regulations for barrier-free facilities; the state energy code; and any other codes so designated by the Washington state legislature as adopted and amended by the council.

(7) "State-wide amendment" means any amendment to the building code, initiated through council action or by petition to the council from any agency, city or county, or interested individual or organization, that would have the effect of amending the building code for the entire state of Washington. State-wide amendments to the state building code must be adopted in accordance with the Administrative Procedure Act, chapter 34.05 RCW.

(8) "State building code update cycle" means that period during which the uniform code and standards referenced in chapter 19.27 RCW are updated and amended by the council in accordance with the Administrative Procedure Act, chapter 34.05 RCW hereinafter referred to as the "adoption period" and those additional periods when code changes are received for review as proposed amendments to the uniform codes, hereinafter referred to as "submission periods."

(9) "Uniform codes" means the Uniform Building, Mechanical, Plumbing, and Fire Codes as published by the International Conference of Building Officials, International Association of Plumbing and Mechanical Officials, and Western Fire Chiefs respectively.

[Statutory Authority: RCW 19.27.035 and chapter 34.05 RCW. 94-05-058, § 51-04-015, filed 2/10/94, effective 3/13/94. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-015, filed 1/3/90, effective 2/3/90.]

WAC 51-04-018 Petition for preliminary review. An agency, city or county, or other interested individual or organization wishing to submit state-wide or local government residential amendments to the building code for council consideration, may file with the council a petition for preliminary review of the state-wide or local government residential amendment, in order to solicit comments from

council members and interested parties, prior to council action.

The council may refer a petition for preliminary review to one of the council standing committees for review and comment.

[Statutory Authority: RCW 19.27.035 and chapter 34.05 RCW. 94-05-058, § 51-04-018, filed 2/10/94, effective 3/13/94. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-018, filed 1/3/90, effective 2/3/90.]

WAC 51-04-020 Policies for the consideration of proposed state-wide amendments. State-wide and emergency state-wide amendments to the state building code should be based on one of the following criteria:

(1) The amendment is needed to address a critical life/safety need.

(2) The amendment is needed to address a specific state policy or statute.

(3) The amendment is needed for consistency with state or federal regulations.

(4) The amendment is needed to address a unique character of the state.

(5) The amendment corrects errors and omissions.

State-wide and emergency state-wide amendments to the state building code shall conform to the purposes, objectives, and standards prescribed in RCW 19.27.020.

The council will accept and consider petitions for emergency state-wide amendments to the building code at any time, in accordance with RCW 19.27.074 and chapter 34.05 RCW.

The council will accept and consider all other petitions for state-wide amendments in conjunction with the state building code update cycle, in accordance with RCW 19.27.074 and chapter 34.05 RCW, and WAC 51-04-015 and 51-04-020 as follows:

In every year excluding the year with the adoption period, the state building code council shall identify a submission period of at least thirty days when revisions to the uniform codes and the state building code which addresses portions of the state building code other than uniform codes may be submitted. The state building code council shall review all submissions and accept for future rule making those revisions favorably reviewed. Revisions accepted shall be submitted to the International Conference of Building Officials, the International Association of Plumbing and Mechanical Officials and the International Fire Code Institute, respectively, as proposed revisions to the uniform codes (unless recently considered as amendments) and held for further review during the adoption period.

The adoption period commences upon availability of the publication of the new edition of the uniform codes by the International Conference of Building Officials, and concludes with formal adoption of the revised building code by the council and final review by the state legislature. For the purposes of this section, the publication of supplements shall not be considered a new edition. At the beginning of the adoption period, the state building code council shall identify a limited submission period of at least thirty days. During this period, the council will receive revisions proposed to:

The uniform codes provided that the proposed revisions shall be limited to revisions which address changes in the uniform codes since the previous edition.

The state building code which addresses existing state-wide amendments to the uniform codes.

The state building code which addresses portions of the state building code other than the uniform codes.

In addition, the state building code council shall review for adoption those proposed revisions to the uniform code accepted after preliminary review in those submission periods since the last adoption period. The state building code council shall consider the action of the International Conference of Building Officials, the International Association of Plumbing and Mechanical Officials and the International Fire Code Institute, respectively, in their consideration of these proposals.

Within sixty days of the receipt of the new edition of the uniform codes the council shall enter rule making to update the building code.

[Statutory Authority: RCW 19.27.035 and chapter 34.05 RCW. 94-05-058, § 51-04-020, filed 2/10/94, effective 3/13/94. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-020, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-04-020, filed 9/1/76.]

WAC 51-04-025 Procedure for submittal or proposed state-wide amendments. All proposed state-wide amendments shall be submitted in writing to the council, on the form provided by the council.

Petitions for state-wide amendments to the building code shall be submitted to the council during the submission period and the adoption period in accordance with WAC 51-04-020.

Petitions for emergency state-wide amendments to the building code may be submitted at any time, in accordance with RCW 19.27.074 and chapter 34.05 RCW, and WAC 51-04-015 and 51-04-020.

The council may refer a proposed state-wide amendment to one of the council standing committees for review and comment prior to council action in accordance with chapter 34.05 RCW.

The council shall deal with all proposed state-wide amendments within the time frames required by chapter 19.27 RCW, RCW 34.05.330, and all other deadlines established by statute.

[Statutory Authority: RCW 19.27.035 and chapter 34.05 RCW. 94-05-058, § 51-04-025, filed 2/10/94, effective 3/13/94. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-025, filed 1/3/90, effective 2/3/90.]

WAC 51-04-030 Policies for consideration of proposed local government residential amendments. All amendments to the building code, as adopted by cities and counties for implementation and enforcement in their respective jurisdictions, that apply to single and multifamily buildings as defined by RCW 19.27.015, shall be submitted to the council for approval.

The council shall consider and approve or deny all proposed local government residential amendments to the building code within ninety days of receipt of a proposal, unless alternative scheduling is agreed to by the council and the proposing entity.

All local government residential amendments to the building code that require council approval shall be submitted in writing to the council, after the city or county legislative body has adopted the amendment and prior to imple-

mentation and enforcement of the amendment by the local jurisdiction.

It is the policy of the council to encourage joint proposals for local government residential amendments from more than one jurisdiction. Local government residential amendments submitted to the council for approval should be based on:

(1) Climatic conditions that are unique to the jurisdiction.

(2) Geologic or seismic conditions that are unique to the jurisdiction.

(3) Environmental impacts such as noise, dust, etc., that are unique to the jurisdiction.

(4) Life, health, or safety conditions that are unique to the local jurisdiction.

(5) Other special conditions that are unique to the jurisdiction.

EXCEPTIONS: Appendices or portions thereof that have the effect of amending the uniform codes, that do not conflict with the building code for single and multifamily residential buildings as defined by RCW 19.27.015, may be adopted by local jurisdictions without council review or approval.

Local government residential amendments to:

(1) Chapter 1, 17, or 34 of the Uniform Building Code;

(2) Chapter 1 of the Uniform Mechanical Code;

(3) Article 1, 2, 3 or 4 of the Uniform Fire Code;

(4) Part 1 of the Uniform Plumbing Code;

(5) Chapter 1 or 11 of the State Energy Code; or

(6) Chapter 1 of the Ventilation and Indoor Air Quality Code need not be submitted to the Council for review and approval provided that such amendments do not diminish the construction requirements of those chapters.

Those portions of the supplement or accumulative supplements that affect single and multifamily residential buildings as defined by RCW 19.27.015 that are not adopted by the council shall be submitted to the council for consideration as local government residential amendments to the building code.

Local government residential amendments shall conform to the limitations provided in RCW 19.27.040.

[Statutory Authority: Chapter 19.27 RCW. 95-01-127, § 51-04-030, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-030, filed 1/3/90, effective 2/3/90.]

WAC 51-04-035 Procedure for submittal of proposed local government residential amendments. All proposed local government residential amendments to the state building code shall be submitted in writing to the council, on a form provided by the council, along with a statement of need for the proposed amendment.

The council shall accept and consider all applications for review of local government residential amendments submitted to the council in a proper manner.

The council may refer a proposed local government residential amendment to one of the council standing committees for review and comment prior to council action in accordance with RCW 19.27.074.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-035, filed 1/3/90, effective 2/3/90.]

WAC 51-04-037 Preapproved local government residential amendments. Any local government residential amendment, that the council determines to be appropriate for adoption by other local governments, may be designated as a preapproved local government residential amendment.

A preapproved local government residential amendment may be adopted by any local government upon notification of the council.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-037, filed 1/3/90, effective 2/3/90.]

WAC 51-04-040 Reconsideration. Any party proposing a state-wide or local government amendment to the building code may, upon denial of the amendment by the council, file a petition for reconsideration in accordance with RCW 34.05.470.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-040, filed 1/3/90, effective 2/3/90.]

WAC 51-04-050 Ex parte communications. All written communications received by council members during council rule-making proceedings, shall be forwarded to staff for inclusion in the public record.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-050, filed 1/3/90, effective 2/3/90.]

WAC 51-04-060 Opinions. RCW 19.27.031 grants the council authority to render opinions relating to the building code at the request of a local building official.

For the purposes of this section, the term "building official" means the local or state official, or their designee, responsible for implementation and enforcement of the specific code provision on which the opinion is requested.

Council building code related opinions shall be limited to the state regulations for barrier-free facilities, the state energy code, the state ventilation and indoor air quality code, and council amendments to the uniform codes.

Council related opinions may be developed and approved by a standing committee of the council.

Opinions approved by a standing committee may be reviewed and modified by the council.

Energy code related opinions shall be developed in consultation with the Washington state energy office.

[Statutory Authority: RCW 19.27.035 and chapter 34.05 RCW. 94-05-058, § 51-04-060, filed 2/10/94, effective 3/13/94. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-060, filed 1/3/90, effective 2/3/90.]

WAC 51-04-070 Council mailing address. All requests for information, documentation, etc., should be submitted to:

Washington State Building Code Council
Ninth and Columbia Building
Mailstop: GH-51
Olympia, Washington 98504-4151
(360) 753-2222

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-070, filed 1/3/90, effective 2/3/90.]

Chapter 51-06 WAC
PUBLIC RECORDS

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

51-06-030 Definitions. [Order 76-02, § 51-06-030, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

51-06-040 Public records officer. [Order 76-02, § 51-06-040, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

51-06-050 Office hours. [Order 76-02, § 51-06-050, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

51-06-060 Requests for public records. [Order 76-02, § 51-06-060, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

51-06-080 Exemptions. [Order 76-02, § 51-06-080, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

51-06-090 Review of denials of public records requests. [Order 76-02, § 51-06-090, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

51-06-100 Protection of public records. [Order 76-02, § 51-06-100, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

51-06-110 Records index. [Order 76-02, § 51-06-110, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

WAC 51-06-010 Purpose of chapter. The purpose of this chapter shall be to ensure compliance by the state building code council (hereinafter referred to as the "council"), including its members and staff, with the provisions of chapter 42.17 RCW (Initiative 276), and in particular with RCW 42.17.250 - 42.17.320 dealing with public records.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-06-010, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-06-010, filed 9/1/76.]

WAC 51-06-020 Public records available. All public records of the council as defined in WAC 51-06-030 are available for public inspection and copying at the Department of Community Development, Ninth and Columbia Building, Olympia, Washington 98504, pursuant to these rules, except as otherwise provided by RCW 42.17.310.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-06-020, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-06-020, filed 9/1/76.]

WAC 51-06-070 Copying. The department of community development may charge a fee of twenty-five cents per page for providing copies of public records and for use of the office's copy equipment.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-06-070, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-06-070, filed 9/1/76.]

WAC 51-06-120 Address for communications. All requests for information, documentation, etc., should be submitted to the:

Washington State Building Code Council
Ninth and Columbia Building
Mailstop: GH-51
Olympia, Washington 98504-4151
(360) 753-2222

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-06-120, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-06-120, filed 9/1/76.]

Chapter 51-08 WAC
UNIFORM PROCEDURAL RULES

WAC

WAC 51-08-010 Uniform procedural rules. The state building code council, hereinafter referred to as the council, adopts as its own rules of practice all those uniform procedural rules promulgated by the code reviser now codified in the Washington Administrative Code, as WAC 1-08-005 through 1-08-590, as now or hereinafter amended, subject to any additional rules the council may add from time to time. The council reserves the right to make whatever determination is fair and equitable should any question not covered by its rules come before the council, said determination to be in accordance with the spirit and intent of the law.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-08-010, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-08-010, filed 9/1/76.]

Chapter 51-11 WAC
WASHINGTON STATE ENERGY CODE

WAC

CHAPTER 16
RESERVED

CHAPTER 17
STANDARDS

CHAPTER 18
RESERVED

CHAPTER 19
RESERVED

CHAPTER 20
DEFAULT HEAT-LOSS COEFFICIENTS

REFERENCE STANDARD COMMERCIAL
BUILDING DESIGN BY SYSTEMS ANALYSIS

WAC 51-11-0100 Chapter 1—Administration and enforcement.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0100, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0101 Section 101. Scope and general requirements.

101.1 Title: Chapters 1 through 10 of this Code shall be known as the "Washington State Residential Energy Code" and may be cited as such; and will be referred to herein as "this Code."

101.2 Purpose and Intent: The purpose of this Code is to provide minimum standards for new or altered buildings and structures or portions thereof to achieve efficient use and conservation of energy.

The purpose of this Code is not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefitted by the terms of this Code.

It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques to achieve efficient use and conservation of energy. These provisions are structured to permit compliance with the intent of this Code by any one of the following three paths of design:

1. A systems analysis approach for the entire building and its energy-using sub-systems which may utilize renewable energy sources, Chapter 4.

2. A component performance approach for various building elements and mechanical systems and components, Chapter 5.

3. A prescriptive requirements approach, Chapter 6.

Compliance with any one of these approaches meets the intent of this Code. This Code is not intended to abridge any safety or health requirements required under any other applicable codes or ordinances.

The provisions of this Code do not consider the efficiency of various energy forms as they are delivered to the building envelope. A determination of delivered energy efficiencies in conjunction with this Code will provide the most efficient use of available energy in new building construction.

101.3 Scope: This Code sets forth minimum requirements for the design of new buildings and structures that provide facilities or shelter for residential occupancies by regulating their exterior envelopes and the selection of their HVAC, service water heating, electrical distribution and illuminating systems and equipment for efficient use and conservation of energy.

Buildings shall be designed to comply with the requirements of either Chapter 4, 5, or 6 of this Code.

101.3.1 Exempt Buildings: Buildings and structures or portions thereof meeting any of the following criteria shall be exempt from the building envelope requirements of sections 502 and sections 602 and 605, but shall comply with all other requirements for building mechanical systems, service water heating and lighting systems.

101.3.1.1: Buildings and structures or portions thereof whose peak design rate of energy usage is less than three and four tenths (3.4) Btu/h per square foot or one point zero (1.0) watt per square foot of floor area for space conditioning requirements.

101.3.1.2: Buildings and structures or portions thereof which are neither heated according to the definition of heated space in Chapter 2, nor cooled by a nonrenewable energy source, provided that the nonrenewable energy use for space conditioning complies with requirements of section 101.3.1.1.

101.3.1.3: Greenhouses isolated from any conditioned space and not intended for occupancy.

101.3.2 Application to Existing Buildings: Additions, historic buildings, changes of occupancy or use, and alterations or repairs shall comply with the requirements in the subsections below.

EXCEPTION: The building official may approve designs of alterations or repairs which do not fully conform with all of the requirements of this Code where in the opinion of the building official full compliance is physically impossible and/or economically impractical and:

1. The alteration or repair improves the energy efficiency of the building; or

2. The alteration or repair is energy efficient and is necessary for the health, safety, and welfare of the general public.

In no case, shall building envelope requirements or mechanical system requirements be less than those requirements in effect at the time of the initial construction of the building.

101.3.2.1 Additions to Existing Buildings: Additions to existing buildings or structures may be made to such buildings or structures without making the entire building or structure comply, provided that the new additions shall conform to the provisions of this Code.

EXCEPTION: New additions which do not fully comply with the requirements of this Code and which have a floor area which is less than seven hundred fifty square feet shall be approved provided that improvements are made to the existing occupancy to compensate for any deficiencies in the new addition. Compliance shall be demonstrated by either systems analysis or component performance calculations. The nonconforming addition and upgraded, existing occupancy shall have an energy budget or heat loss which is less than or equal to the unimproved existing building, with the addition designed to comply with this Code.

101.3.2.2 Historic Buildings: The building official may modify the specific requirements of this Code for historic buildings and require in lieu thereof alternate requirements which will result in a reasonable degree of energy efficiency. This modification may be allowed for those buildings which have been specifically designated as historically significant by the state or local governing body, or listed in The National Register of Historic Places or which have been determined to be eligible for listing.

101.3.2.3 Change of Occupancy or Use:

Any Other than Group R Occupancy which is converted to Group R Occupancy shall be brought into full compliance with this Code.

101.3.2.4 Alterations and Repairs: All alterations and repairs to buildings or portions thereof originally constructed subject to the requirements of this Code shall conform to the provisions of this Code without exception. For all other existing buildings, initial tenant alterations shall comply with the new construction requirements of this Code. Other alterations and repairs may be made to existing buildings and moved buildings without making the entire building comply with all of the requirements of this Code for new buildings, provided the following requirements are met:

101.3.2.5 Building Envelope: The result of the alterations or repairs both:

1. Improves the energy efficiency of the building, and

2. Complies with the overall average thermal transmittance values of the elements of the exterior building envelope in Table 5-1 of Chapter 5 or the nominal R-values and glazing requirements of the reference case in Tables 6-1 to 6-6.

EXCEPTIONS:

1. Untested storm windows may be installed over existing glazing for an assumed U-value of 0.90, however, where glass and sash are being replaced in Group R Occupancy, glazing with a maximum area weighted average U-value of 0.40 shall be installed where there is an electric resistance space heating system and glazing with a maximum U-value of 0.65 (Climate Zone I) and 0.60 (Climate Zone II) shall be installed where there is any other space heating system.

2. Where the structural elements of the altered portions of roof/ceiling, wall or floor are not being replaced, these elements shall be deemed to comply with this Code if all existing framing cavities which are exposed during construction are filled to the full depth with batt insulation or insulation having an equivalent nominal R-value while, for roof/ceilings, maintaining the required space for ventilation. Existing walls and floors without framing cavities need not be insulated. Existing roofs shall be insulated to the requirements of this Code if

a. The roof is uninsulated or insulation is removed to the level of the sheathing, or

b. All insulation in the roof/ceiling was previously installed exterior to the sheathing or nonexistent.

101.3.2.6 Building Mechanical Systems: Those parts of systems which are altered or replaced shall comply with section 503 of this Code.

101.3.2.7 Service Water Heating: Those parts of systems which are altered or replaced shall comply with section 504.

101.3.2.8 Reserved.

101.3.3 Mixed Occupancy: When a building houses more than one occupancy, each portion of the building shall conform to the requirements for the occupancy housed therein. Where approved by the building official, where minor accessory uses do not occupy more than ten percent of the area of any floor of a building, the major use may be considered the building occupancy.

101.4 Amendments by Local Government: Except as provided in RCW 19.27A.020(7), this Code shall be the maximum and minimum energy code for Group R Occupancy in each town, city and county, no later than July 1, 1991.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0101, filed 10/18/93, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0101, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0102 Materials and equipment.

102.1 Identification: All materials and equipment shall be identified in order to show compliance with this Code.

102.2 Maintenance Information: Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product. Maintenance instructions shall be furnished for any equipment which requires preventive maintenance for efficient operation.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0102, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0103 Alternate materials—Method of construction, design or insulating systems. The provisions of this Code are not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the building official as meeting the intent of this Code. The building official may approve any such alternate provided he finds the proposed alternate meets or exceeds the provisions of this Code and that the material, method, design or work offered is for the purpose intended, at least the equivalent of that prescribed in this Code, in quality, strength, effectiveness, fire-resistance, durability, safety, and efficient use and conservation of energy. The building

official may require that sufficient evidence of proof be submitted to substantiate any claims that may be made regarding performance capabilities.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0103, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0104 Plans and specifications.

104.1 General: If required by the building official, plans and specifications shall be submitted in support of an application for a building permit. If required by the building official, plans and specifications shall be stamped and authenticated by a registered design professional currently licensed in the state of Washington. If required by the building official, all energy calculations submitted under the provisions of Chapter 4 for Other than Group R Occupancy shall be stamped and authenticated by an engineer or architect licensed to practice by the state. All plans and specifications, together with supporting data, shall be submitted to the building official prior to issuance of a building permit.

104.2 Details: The plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed including, but not limited to: design criteria, exterior envelope component materials, U-values of the envelope systems, R-values of insulating materials, size and type of apparatus and equipment, equipment and systems controls and other pertinent data to indicate compliance with the requirements of this Code.

The building official may accept the professional stamp of an architect or engineer licensed to do business by the state in lieu of a plan and specification check if the engineer or architect stipulates to the best of his knowledge, understanding and belief, the design meets the requirements of this Code.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0104, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0105 Inspections and enforcement.

105.1 General: All construction or work for which a permit is required shall be subject to inspection by the building official and all such construction or work shall remain accessible and exposed for inspection purposes until approved by the building official.

105.2 Approvals Required: No work shall be done on any part of the building or structure beyond the point indicated in each successive inspection without first obtaining the approval of the building official.

105.2.1 Required Inspections: The building official, upon notification, shall make the following inspection in addition to those inspections required in section 108.5 of the Washington State Uniform Building Code:

1. Wall insulation inspection: To be made after all wall insulation and air vapor retarder sheet or film materials are in place, but before any wall covering is placed.

105.3 Reinspection: The building official may require a structure to be reinspected.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0105, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0105, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0106 Violations. It shall be unlawful for any person, firm, or corporation to erect or construct any building, or remodel or rehabilitate any existing building or structure in the state, or allow the same to be done, contrary to or in violation of any of the provisions of this Code.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0106, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0107 Liability. Nothing contained in this Code is intended to be nor shall be construed to create or form the basis for any liability on the part of any city or county or its officers, employees or agents for any injury or damage resulting from the failure of a building to conform to the provisions of this Code.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0107, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0108 Conflicts with other codes. In addition to the requirements of this Code, all occupancies shall conform to the provisions included in the State Building Code (chapter 19.27 RCW) and Uniform Building Code and Standards Adoption and Amendment rules (chapter 51-30 WAC). In case of conflicts among codes enumerated in RCW 19.27.031 (1), (2), (3), and (4) and this Code, the first named code shall govern over the following. Provided, in the case of conflict between the duct insulation requirements of this Code and the duct insulation requirements of Table 6-D of the Uniform Mechanical Code (chapter 51-32 WAC), the duct insulation requirements of this Code, or where applicable, a local jurisdiction's energy code shall govern.

Where, in any specific case, different sections of this Code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable. Wherever in this Code reference is made to the appendix, the provisions in the appendix shall not apply unless specifically adopted.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0108, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0108, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0109 Severability. If any provision of this Code or its application to any person or circumstance is held invalid, the remainder of this Code or the application of the provision to other persons or circumstances is not affected.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0109, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0200 Chapter 2—Definitions.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0200, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0201 General definitions.

201.1 Application of Terms: For the purposes of this Code, certain abbreviations, terms, phrases, words and their derivatives, shall be as set forth in this chapter. Where terms are not defined, they shall have their ordinary accepted meanings within the context with which they are used. In the event there is a question about the definition of a term, the definitions for terms in the codes enumerated in RCW 19.27.031 and the edition of Webster's dictionary referenced therein shall be considered as the sources for providing ordinarily accepted meanings.

AAMA: American Architectural Manufacturers Association

Addition: See the Washington State Building Code.

Advanced framed ceiling: Advanced framing assumes full and even depth of insulation extending to the outside edge of exterior walls. (See Standard Framing.)

Advanced framed walls: Studs framed on twenty-four inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and one stud is used to support each header. Headers consist of double 2X material with R-10 insulation between the header and exterior sheathing. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall.

AFUE. Annual fuel utilization efficiency: Unlike steady state conditions, this rating is based on average usage including on and off cycling as set out in the standardized Department of Energy Test Procedures.

Air conditioning, comfort: The process of treating air to control simultaneously its temperature, humidity, cleanliness and distribution to meet requirements of the conditioned space.

ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

ASTM: American Society for Testing and Materials

Automatic: Self-acting, operating by its own mechanism when actuated by some impersonal influence, as for example, a change in current strength, pressure, temperature or mechanical configuration. (See **Manual.**)

Below grade walls: Walls or the portion of walls which are entirely below the finish grade or which extend two feet or less above the finish grade.

Building, existing: See the Washington State Building Code.

Boiler capacity: The rate of heat output in Btu/h measured at the boiler outlet, at the design inlet and outlet conditions and rated fuel/energy input.

Building envelope: The elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior or to or from spaces exempted by the provisions of Section 101.3.1.

Building official: The official authorized to act in behalf of a jurisdiction code enforcement agency or its authorized representative.

Building project: A building or group of buildings, including on-site energy conversion or electric-generating facilities, which utilize a single submittal for a construction permit or are within the boundary of a contiguous area under one ownership.

Comfort envelope: The area on a psychrometric chart enclosing all those conditions described in Standard RS-4, Figure No. 1, as being comfortable.

Conditioned space: All spaces which are provided with heated and/or cooled air or which are capable of being maintained at temperatures over fifty degrees F during the heating season, including adjacent connected spaces separated by an uninsulated component (e.g., basements, utility rooms, garages, corridors).

Cooled space: Space within a building which is provided with a positive cooling supply.

COP - Coefficient of performance: The ratio of the rate of net heat output (heating mode) or heat removal (cooling mode) to the rate of total on-site energy input to the heat pump, expressed in consistent units and under designated rating conditions. (See Net Heat Output, Net Heat Removal, Total On-Site Energy Input.)

Deadband: The temperature range in which no heating or cooling is used.

Degree day, heating: A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one day when the mean temperature is less than sixty-five degrees F there exist as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and sixty-five degrees F.

Door: An operable opening area in the shell of a conditioned space, excluding sliding glass doors, which is designed and used as a means of ingress and egress. A door may also include a double door one of which is fixed and one of which is operable.

Door area: Total area of door measured using the rough opening and including the door and frame.

Dwelling unit: See the Washington State Building Code.

EER. Energy efficiency ratio: The ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions.

Efficiency, HVAC system: The ratio of useful energy (at the point of use) to the energy input for a designated time period, expressed in percent.

Emissivity: The ability to absorb infrared radiation. A low emissivity implies a higher reflectance of infrared radiation.

Energy: The capacity for doing work; taking a number of forms which may be transformed from one into another, such as thermal (heat), mechanical (work), electrical and chemical; in customary units, measured in kilowatt-hours (kWh) or British thermal units (Btu). (See **New energy.**)

Energy, recovered: (See **Recovered energy.**)

Exterior envelope: (See **Building envelope.**)

Floor over unconditioned space: A floor which separates a conditioned space from an unconditioned space which is buffered from exterior ambient conditions including vented crawl spaces and unconditioned basements or other similar spaces, or exposed to exterior ambient conditions including open parking garages and enclosed garages which are mechanically ventilated.

F-Value: The perimeter heat loss factor expressed in Btu/hr●ft●°F.

Glazing: All areas, including the frames, in the shell of a conditioned space that let in natural light including windows, clerestories, skylights, sliding glass doors and glass block walls. The daylight opening area in all other doors shall be considered glazing for the purpose of calculating

glazing area. The daylight opening area in all other doors is included in the door U-value and shall not be considered in calculations of glazing U-values.

Glazing area: Total area of the glazing measured using the rough opening, and including the glazing, sash, and frame. For sliding glass doors the glazing area is the rough opening area. For all other doors the glazing area is the daylight opening area.

Gross conditioned floor area: The horizontal projection of that portion of interior space which is contained within exterior walls and which is conditioned directly or indirectly by an energy-using system, and which has an average height of five feet or greater, measured from the exterior faces.

Gross exterior wall area: The normal projection of the building envelope wall area bounding interior space which is conditioned by an energy-using system; includes opaque wall, window and door areas. The gross area of walls consists of all opaque wall areas, including foundation walls, between floor spandrels, peripheral edges of floors, window areas including sash, and door areas, where such surfaces are exposed to exterior ambient conditions and enclose a conditioned space including interstitial areas between two such spaces.

Gross floor area: The sum of the areas of the several floors of the building, including basements, cellars, mezzanine and intermediate floored tiers and penthouses of headroom height, measured from the exterior faces of exterior walls or from the center line of walls separating buildings, but excluding: Covered walkways, open roofed-over areas, porches and similar spaces. Pipe trenches, exterior terraces or steps, chimneys, roof overhangs and similar features.

Gross roof/ceiling area: The sum of the areas of the roof/ceiling assembly, consisting of the total interior surface area of all elements, including skylights, which enclose a conditioned space.

Guest room: See the Washington State Building Code.

Heat: The form of energy that is transferred by virtue of a temperature difference.

Heat storage capacity: The physical property of materials (mass) located inside the building envelope to absorb, store, and release heat.

Heated space: Space within a building which is provided with a positive heating supply. Finished living space within a basement or registers or heating devices designed to supply heat to a basement space shall automatically define that space as heated space. (See Positive Heating Supply.)

HSPF. Heating season performance factor: The total heating output (in Btu) of a heat pump during its normal annual usage period for heating divided by the total (watt hour) electric power input during the same period, as determined by test procedures consistent with the U.S. Department of Energy "Test Procedure for Central Air Conditioners, Including Heat Pumps" published in the December 27, 1979, Federal Register, Vol 44, No. 24, IOCFR. 430. When specified in Btu per watt hour an HSPF of 6.826 is equivalent to a COP of 2.0.

Humidistat: A regulatory device, actuated by changes in humidity, used for automatic control of relative humidity.

HVAC: Heating, ventilating and air conditioning.

HVAC system components: HVAC system components provide, in one or more factory-assembled packages, means for chilling and/or heating water with controlled temperature for delivery to terminal units serving the conditioned spaces of the buildings. Types of HVAC system components include, but are not limited to, water chiller packages, reciprocating condensing units and water source (hydronic) heat pumps. (See **HVAC system equipment.**)

HVAC system efficiency: (See **Efficiency, HVAC system.**)

HVAC system equipment: HVAC system equipment provides, in one (single package) or more (split system) factory-assembled packages, means for air circulation, air cleaning, air cooling with controlled temperature and dehumidification; and optionally, either alone or in combination with a heating plant, the functions of heating and humidifying. The cooling function may be either electrically or heat operated and the refrigerant condenser may be air, water or evaporatively cooled. Where the equipment is provided in more than one package, the separate packages shall be designed by the manufacturer to be used together. The equipment may provide the heating function as a heat pump or by the use of electric elements. (The word "equipment" used without modifying adjective may, in accordance with common industry usage, apply either to HVAC system equipment or HVAC system components.)

Illumination: The density of the luminous flux incident on a surface; it is the quotient of the luminous flux by the area of the surface when the latter is uniformly illuminated.

Infiltration: The uncontrolled inward air leakage through cracks and interstices in any building element and around windows and doors of a building caused by the pressure effects of wind and/or the effect of differences in the indoor and outdoor air density.

Insulation baffle: A rigid material, resistant to wind driven moisture, the purpose of which is to allow air to flow freely into the attic or crawl space and to prevent insulation from blocking the ventilation of these spaces, or the loss of insulation. Example materials for this purpose are sheet metal, or wax impregnated cardboard.

Luminaire: A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the electric power supply.

Manual: Capable of being operated by personal intervention. (See **Automatic.**)

Net heat output: The change in the total heat content of the air entering and leaving the equipment (not including supplementary heat and heat from boilers).

Net heat removal: The total heat content of the air entering and leaving the equipment (without heat) or the difference in total heat content of the water or refrigerant entering and leaving the component.

New energy: Energy, other than recovered energy, utilized for the purpose of heating or cooling. (See **energy.**)

Nominal R-value: The thermal resistance of insulation as specified by the manufacturer according to recognized trade and engineering standards.

Nonrenewable energy sources: All energy sources that are not renewable energy sources including natural gas, oil, coal, wood, liquified petroleum gas, steam, and any utility-supplied electricity.

Occupancy: See the Washington State Building Code.

Opaque envelope areas: All exposed areas of a building envelope which enclose conditioned space, except openings for windows, skylights, doors, glazing and building service systems.

Open blown: Loose fill insulation pneumatically installed in an unconfined attic space.

Outdoor air: Air taken from the outdoors and, therefore, not previously circulated through the system.

Packaged terminal air conditioner: A factory-selected combination of heating and cooling components, assemblies or sections intended to serve a room or zone. (For the complete technical definition, see Standard RS-10.)

Packaged terminal heat pump: A factory-selected combination of heating and cooling components, assemblies or sections intended for application in an individual room or zone. (For the complete technical definition, see Standard RS-21.)

Permeance (perm): The ability of a material of specified thickness to transmit moisture in terms of amount of moisture transmitted per unit time for a specified area and differential pressure (grains per hour•ft²•inches of HG). Permeance may be measured using ASTM E-96-72 or other approved dry cup method as specified in RS-1.

Pool cover: A vapor-retardant cover which lies on or at the surface of the pool.

Positive cooling supply: Mechanical cooling deliberately supplied to a space, such as through a supply register. Also, mechanical cooling indirectly supplied to a space through uninsulated surfaces of space cooling components, such as evaporator coil cases and cooling distribution systems which are capable of maintaining air temperatures within the space of eighty-five degrees F, or lower, at the exterior design conditions specified in Section 302.1. To be considered exempt from inclusion in this definition, such surfaces shall comply with the insulation requirements of this Code.

Positive heating supply: Heat deliberately supplied to a space by design, such as a supply register, radiator or heating element. Also, heat indirectly supplied to a space through uninsulated surfaces of service water heaters and space heating components, such as furnaces, boilers and heating and cooling distributions systems which are capable of maintaining air temperature within the space of fifty degrees F, or higher, at the exterior design conditions specified in Section 302.1. To be considered exempt from inclusion in this definition, such surfaces shall comply with the insulation requirements of this Code.

Power: In connection with machines, the time rate of doing work. In connection with the transmission of energy of all types, the rate at which energy is transmitted; in customary units, it is measured in watts (W) or British Thermal Units per hour (Btu/h).

Public facility rest room: A rest room used by the transient public on a regular (rather than casual) basis. Examples include rest rooms in service stations, airports, train terminals and convention halls. Rest rooms incorporated with private guest rooms in hotels, motels or dormitories and rest room facilities intended for the use of employees and not usually used by the general public are not considered public facility rest rooms.

Radiant slab: A slab on grade containing heated pipes, ducts, or electric heating cables that constitute a radiant slab or portion thereof for a complete or partial heating of the structure.

Readily accessible: See the Washington State Mechanical Code.

Recooling: The removal of heat by sensible cooling of the supply air (directly or indirectly) that has been previously heated above the temperature to which the air is to be supplied to the conditioned space for proper control of the temperature of that space.

Recovered energy: Energy utilized which would otherwise be wasted (i.e. not contribute to a desired end use) from an energy utilization system.

Reheat: The application of sensible heat to supply air that has been previously cooled below the temperature of the conditioned space by either mechanical refrigeration or the introduction of outdoor air to provide cooling.

Renewable energy sources: Renewable energy sources of energy (excluding minerals) are derived from: (1) incoming solar radiation, including but not limited to, natural daylighting and photosynthetic processes; (2) energy sources resulting from wind, waves and tides, lake or pond thermal differences; and (3) energy derived from the internal heat of the earth, including nocturnal thermal exchanges.

Reset: Adjustment of the set point of a control instrument to a higher or lower value automatically or manually to conserve energy.

Roof/ceiling assembly: A roof/ceiling assembly shall be considered as all components of the roof/ceiling envelope through which heat flows, thus creating a building transmission heat loss or gain, where such assembly is exposed exterior ambient conditions to and encloses a conditioned space. The gross area of a roof/ceiling assembly consists of the total interior surface of such assembly, including skylights.

Sequence: A consecutive series of operations.

Service systems: All energy-using systems in a building that are operated to provide services for the occupants or processes housed therein, including HVAC, service water heating, illumination, transportation, cooking or food preparation, laundering or similar functions.

Service water heating: Supply of hot water for domestic or commercial purposes other than comfort heating.

Shaded: Glazed area which is externally protected from direct solar radiation by use of devices permanently affixed to the structure or by an adjacent building, topographical feature, or vegetation.

Shall: Denotes a mandatory code requirement.

Single family: One and two family residential dwelling units with no more than two units in a single building.

Skylight: A glazing surface that has a slope of less than sixty degrees from the horizontal plane.

Slab-on-grade, exterior: Any portion of a slab floor in contact with the ground which is less than or equal to twenty-four inches below the final elevation of the nearest exterior grade.

Slab-below-grade: Any portion of a slab floor in contact with the ground which is more than twenty-four inches below the final elevation of the nearest exterior grade.

Small business: Any business entity (including a sole proprietorship, corporation, partnership, or other legal entity)

which is owned and operated independently from all other businesses, which has the purpose of making a profit, and which has fifty or fewer employees, or which has a million dollars or less per year in gross sales, of window products.

Solar energy source: Source of natural daylighting and of thermal, chemical or electrical energy derived directly from conversion of incident solar radiation.

Standard framing: All framing practices not defined as "intermediate" or "advanced" shall be considered standard. (See Advanced framed ceiling, Advanced framed walls, Intermediate framed wall.)

Substantial contact: A condition where adjacent building materials are placed in a manner that proximal surfaces are contiguous, being installed and supported as to eliminate voids between materials, without compressing or degrading the thermal performance of either product.

System: A combination of central or terminal equipment or components and/or controls, accessories, interconnecting means, and terminal devices by which energy is transformed so as to perform a specific function, such as HVAC, service water heating or illumination.

Tapering: Installation of a reduced level of ceiling insulation at the eaves, due to reduced clearance.

Thermal by-pass: An area where the envelope surrounding the conditioned space is breached, or where an ineffective application compromises the performance of a thermal or infiltration barrier, increasing the structure's energy consumption by exposing finished surfaces to ambient conditions and additional heat transfer.

Thermal conductance (C): Time rate of heat flow through a body (frequently per unit area) from one of its bounding surfaces to the other for a unit temperature difference between the two surfaces, under steady conditions (Btu/hr●ft²●°F).

Thermal resistance (R): The reciprocal of thermal conductance (hr●ft²●°F/Btu).

Thermal transmittance (U): The coefficient of heat transmission (air to air). It is the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/hr●ft²●°F). The U-value applies to the fractional combinations of different materials used in series along the heat flow path.

Thermal transmittance, overall (U_o): The overall (average) heat transmission of a gross area of the exterior building envelope (Btu/hr●ft²●°F). The U_o-value applies to the combined effect of the time rate of heat flows through the various parallel paths, such as windows, doors and opaque construction areas, comprising the gross area of one or more exterior building components, such as walls, floors or roof/ceiling.

Thermostat: An automatic control device actuated by temperature and designed to be responsive to temperature.

Total on-site energy input: The combination of all the energy inputs to all elements and accessories as included in the equipment components, including but not limited to, compressor(s), compressor sump heater(s), circulating pump(s), purge devices, fan(s), and the HVAC system component control circuit.

Transmission coefficient: The ratio of the solar heat gain through a glazing system to that of an unshaded single pane of double strength window glass under the same set of conditions.

U-Value: See thermal transmittance.

Uniform Building Code: The Washington State Uniform Building Code as modified by the Washington State Building Code Council.

Uniform Mechanical Code: The Washington State Uniform Mechanical Code as modified by the Washington State Building Code Council.

Unitary cooling and heating equipment: One or more factory-made assemblies which include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well. Where such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

Unitary heat pump: One or more factory-made assemblies which include an indoor conditioning coil, compressor(s) and outdoor coil or refrigerant-to-water heat exchanger, including means to provide both heating and cooling functions. When such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

Vapor retarder: A layer of low moisture transmissivity material (not more than 1.0 perm dry cup) placed over the warm side (in winter) of insulation, over the exterior of below grade walls, and under floors as ground cover to limit the transport of water and water vapor through exterior walls, ceilings, and floors. Vapor retarding paint, listed for this application, also complies with this Code.

Vaulted ceilings: All ceilings where enclosed joist or rafter space is formed by ceilings applied directly to the underside of roof joists or rafters.

Ventilation: The process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned.

Ventilation air: That portion of supply air which comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

Walls (exterior): Any member or group of members which defines the exterior boundaries or courts of a building and which have a slope of sixty degrees or greater with the horizontal plane, and separates conditioned from unconditioned space. Band joists between floors are to be considered a part of exterior walls.

Zone: A space or group of spaces within a building with heating and/or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device. Each dwelling unit in residential buildings shall be considered a single zone.

[Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0201, filed 2/10/94, effective 4/1/94. Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0201, filed 10/18/93, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0201, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0300 Chapter 3—Design conditions.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0300, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0301 Design criteria.

301.1 General:

The criteria of this chapter establish the design conditions upon which the minimum thermal design requirements of the building envelope and the design of the HVAC system are to be based.

301.2 Heating and Cooling: A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements as required in this code when requirements of the exterior envelope differ.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0301, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0302 Thermal design parameters.

302.1 Exterior Design Conditions: The heating or cooling outdoor design temperatures shall be selected from 0.6 percent column for winter and 0.5 percent column for summer from the Puget Sound Chapter of ASHRAE publication "Recommended Outdoor Design Temperatures, Washington State, ASHRAE." (See also Washington State Energy Code Manual.)

302.2 Interior Design Conditions:

302.2.1 Indoor Design Temperature: Indoor design temperature shall be seventy degrees F for heating and seventy-eight degrees F for cooling.

EXCEPTION: Other design temperatures may be used for equipment selection if it results in a lower energy usage.

302.2.2 Humidification: If humidification is provided during heating, it shall be designed for a maximum relative humidity of thirty percent. When comfort air conditioning is provided, the actual design relative humidity within the comfort envelope as defined in Standard RS-4, listed in Chapter 7, shall be selected for minimum total HVAC system energy use.

302.3 Climate Zones: All buildings shall comply with the requirements of the appropriate climate zone as defined herein.

ZONE 1: Climate Zone 1 shall include all counties not included in Climate Zone 2.

ZONE 2: Climate Zone 2 shall include: Adams, Chelan, Douglas, Ferry, Grant, Kittitas, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, and Whitman counties.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0302, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0303 Mechanical ventilation. For all Occupancies, the minimum requirements for ventilation shall comply with the Washington State Ventilation Code and Indoor Air Quality Code. (WAC 51-13)

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0303, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0400 Chapter 4—Building design by systems analysis.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0400, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0401 Scope.

401.1 General: This chapter establishes design criteria in terms of total energy use by a building, including all of its systems. Analysis of design for all Group R Occupancy shall comply with section 402.1 to 402.6.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0401, filed 10/18/93, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0401, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0402 Systems analysis.

402.1 Special Requirements for All Group R Occupancy:

402.1.1 Energy Budgets: Proposed buildings designed in accordance with this section shall be designed to use no more energy from non-renewable sources for space heating, and domestic hot water heating than a standard building whose enclosure elements and energy consuming systems are designed in accordance with section 502.2 of this Code for the appropriate climate zone, and heating system type. Energy derived from renewable sources may be excluded from the total annual energy consumption attributed to the alternative building.

402.1.2 Calculation of Energy Consumption: The application for a building permit shall include documentation which demonstrates, using a calculation procedure as listed in Chapter 8, or an approved alternate, that the proposed building's annual space heating energy use does not exceed the annual space heating and water heating energy use of a standard building conforming to Chapter 5 of this Code for the appropriate climate zone. The total calculated annual energy consumption shall be shown in units of kWh/ft²/year or Btu/ft²/year of conditioned area.

402.1.3 Input Values: The following standardized input values shall be used in calculating annual space heating budgets:

PARAMETER	VALUE
Thermostat set point, heating	65° F
Thermostat set point, cooling	78° F
Thermostat night set back	65° F
Thermostat night set back period	0 hours
Internal gain	
R-3 units	3000 Btu/hr
R-1 units	1500 Btu/hr
Domestic Hot Water Heater Setpoint	120° F
Domestic Hot Water Consumption	20 gallons/person/day.
Minimum heat storage	Calculated using standard engineering practice for the actual building or as approved.

Site weather data	Typical meteorological year (TMY) or ersatz TMY data for the closest appropriate TMY site or other site as approved.
Heating equipment efficiency	
Electric resistance heat	1.00
Heat Pumps	6.80 HSPF.
Other Fuels	0.78 AFUE.

The standard building shall be modeled with glazing area distributed equally among the four cardinal directions. Parameter values that may be varied by the building designer to model energy saving options include, but are not limited to, the following:

1. Overall thermal transmittance, U_o, of building envelope or individual building components;

2. Heat storage capacity of building;

3. Glazing orientation; area; and shading coefficients;

4. Heating system efficiency.

402.1.4 Solar Shading and Access: Building designs using passive solar features with eight percent or more south facing equivalent glazing to qualify shall provide to the building official a sun chart or other approved documentation depicting actual site shading for use in calculating compliance under this section. The building shall contain at least forty-five Btu/°F for each square foot of south facing glass.

402.1.5 Infiltration: Infiltration levels used shall be set at 0.35 air changes per hour for thermal calculation purposes only.

402.1.6 Heat Pumps: The heating season performance factor (HSPF) for heat pumps shall be calculated using procedures consistent with section 5.2 of the U.S. Department of Energy Test Procedure for Central Air Conditioners, including heat pumps published in the December 27, 1979 Federal Register Vol. 44, No. 24.10 CFR 430. Climate data as specified above, the proposed buildings overall thermal performance value (Btu/°F) and the standardized input assumptions specified above shall be used to model the heat pumps HSPF.

402.2 Energy Analysis: Compliance with this chapter will require an analysis of the annual energy usage, hereinafter called an annual energy analysis.

EXCEPTION: Chapters 5, and 6 of this Code establish criteria for different energy-consuming and enclosure elements of the building which, will eliminate the requirement for an annual systems energy analysis while meeting the intent of this Code.

A building designed in accordance with this chapter will be deemed as complying with this Code if the calculated annual energy consumption is not greater than a similar building (defined as a "standard design") whose enclosure elements and energy-consuming systems are designed in accordance with Chapter 5.

For an alternate building design to be considered similar to a "standard design," it shall utilize the same energy source(s) for the same functions and have equal floor area and the same ratio of envelope area to floor area, environmental requirements, occupancy, climate data and usage operational schedule.

402.3 Design: The standard design, conforming to the criteria of Chapter 5 and the proposed alternative design shall be designed on a common basis as specified herein:

The comparison shall be expressed as kBtu or kWh input per square foot of conditioned floor area per year at the building site.

402.4 Analysis Procedure: The analysis of the annual energy usage of the standard and the proposed alternative building and system design shall meet the following criteria:

a. The building heating/cooling load calculation procedure used for annual energy consumption analysis shall be detailed to permit the evaluation of effect of factors specified in section 402.5.

b. The calculation procedure used to simulate the operation of the building and its service systems through a full-year operating period shall be detailed to permit the evaluation of the effect of system design, climatic factors, operational characteristics, and mechanical equipment on annual energy usage. Manufacturer's data or comparable field test data shall be used when available in the simulation of systems and equipment. The calculation procedure shall be based upon eight thousand seven hundred sixty hours of operation of the building and its service systems.

402.5 Calculation Procedure: The calculation procedure shall cover the following items:

a. Design requirements—Environmental requirements as required in Chapter 3.

b. Climatic data—Coincident hourly data for temperatures, solar radiation, wind and humidity of typical days in the year representing seasonal variation.

c. Building data—Orientation, size, shape, mass, air, moisture and heat transfer characteristics.

d. Operational characteristics—Temperature, humidity, ventilation, illumination, control mode for occupied and unoccupied hours.

e. Mechanical equipment—Design capacity, part load profile.

f. Building loads—Internal heat generation, lighting, equipment, number of people during occupied and unoccupied periods.

EXCEPTION: Group R Occupancy shall comply with calculation procedures in Chapter 8, or an approved alternate.

402.6 Documentation: Proposed alternative designs, submitted as requests for exception to the standard design criteria, shall be accompanied by an energy analysis comparison report. The report shall provide technical detail on the two building and system designs and on the data used in and resulting from the comparative analysis to verify that both the analysis and the designs meet the criteria of Chapter 4 of this Code.

[Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0402, filed 2/10/94, effective 4/1/94. Statutory Authority: RCW

19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0402, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0500 Chapter 5—Building design by component performance approach.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0500, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0501 Scope.

501.1 General: Buildings that are heated or mechanically cooled shall be constructed so as to provide the required thermal performance of the various components. A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements as provided in this Code when requirements of the exterior envelope differ.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0501, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0502 Building envelope requirements.

502.1 General:

502.1.1: The stated U- or F-value of any component assembly, listed in Table 5-1 or 5-2, such as roof/ceiling, opaque wall or opaque floor may be increased and the U-value for other components decreased, provided that the total heat gain or loss for the entire building envelope does not exceed the total resulting from compliance to the U-values specified in this Section.

The U-values for typical construction assemblies are included in Chapter 10. These values shall be used for all calculations. Where proposed construction assemblies are not represented in Chapter 10, values shall be calculated in accordance with Chapters 19-27 in Standard RS-1 listed in Chapter 7, using the framing factors listed in Chapter 10 where applicable.

For envelope assemblies containing metal framing, the U-value shall be determined by one of the following methods:

1. Results of laboratory or field measurements.

2. Standard RS-25, listed in Chapter 7, where the metal framing is bonded on one or both sides to a metal skin or covering.

3. The zone method as provided in Chapter 22 of Standard RS-1, listed in Chapter 7.

4. Effective framing/cavity R-values as provided from the following table for metal stud walls:

WALL FRAMING	CAVITY INSULATION	
	R-11	R-19
2 x 4 @ 16" o.c.	5.50	-
2 x 4 @ 24" o.c.	6.60	-
2 x 6 @ 16" o.c.	-	7.60
2 x 6 @ 24" o.c.	-	8.55

502.1.2: For consideration of thermal mass effects, see section 402.4.

502.1.3: When return air ceiling plenums are employed, the roof/ceiling assembly shall:

a. For thermal transmittance purposes, not include the ceiling proper nor the plenum space as part of the assembly; and

b. For gross area purposes, be based upon the interior face of the upper plenum surface.

502.1.4 Insulation:

502.1.4.1 General: All insulating materials shall comply with sections 2602 and/or 707 of the Uniform Building Code. Substantial contact of the insulation with the surface being insulated is required. All insulation materials shall be installed according to the manufacturer's instructions to achieve proper densities and maintain uniform R-values. To the maximum extent possible, insulation shall extend over the full component area to the intended R-value.

502.1.4.2 Insulation Materials: All insulation materials including facings such as vapor barriers or breather papers installed within floor/ceiling assemblies, roof/ceiling assemblies, walls, crawl spaces, or attics shall have a flame spread rating of less than 25 and a smoke density not to exceed 450 when tested in accordance with UBC Standard 8-1.

EXCEPTIONS:

1. Foam plastic insulation shall comply with section 2602 of the Uniform Building Code.

2. When such materials are installed in concealed spaces of Types III, IV and V construction, the flame spread and smoke developed limitations do not apply to facing, provided that the facing is installed in substantial contact with the unexposed surface of the ceiling, floor or wall finish.

3. Cellulose insulation shall comply with section 707 of the Uniform Building Code.

502.1.4.3 Clearances: Where required, insulation shall be installed with clearances according to manufacturer's specifications. Insulation shall be installed so that required ventilation is unobstructed. For blown or poured loose fill insulation, clearances shall be maintained through installation of a permanent retainer.

502.1.4.4 Access Hatches and Doors: Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment which prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer must be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed R-value of the loose fill insulation.

502.1.4.5 Roof/Ceiling Insulation: Open-blown or poured loose fill insulation may be used in attic spaces where the slope of the ceiling is not more than 3 feet in 12 and there is at least 30 inches of clear distance from the top of the bottom chord of the truss or ceiling joist to the underside of the sheathing at the roof ridge. When eave vents are installed, baffling of the vent openings shall be provided so as to deflect the incoming air above the surface of the insulation. Baffles shall be, rigid material, resistant to

wind driven moisture. Requirements for baffles for ceiling insulation shall meet the Uniform Building Code section 1505.3 for minimum ventilation requirements. When feasible, the baffles shall be installed from the top of the outside of the exterior wall, extending inward, to a point 6 inches vertically above the height of noncompressed insulation, and 12 inches vertically above loose fill insulation.

502.1.4.6 Wall Insulation: Insulation installed in exterior walls shall comply with the provisions of this section. All wall insulation shall fill the entire cavity. Exterior wall cavities isolated during framing shall be fully insulated to the levels of the surrounding walls. All faced insulation shall be face stapled to avoid compression.

502.1.4.7 Floor Insulation: Floor insulation shall be installed in a permanent manner in substantial contact with the surface being insulated. Insulation supports shall be installed so spacing is no more than 24 inches on center. Foundation vents shall be placed so that the top of the vent is below the lower surface of the floor insulation.

EXCEPTION: Insulation may be omitted from floor areas over heated basements, heated garages or underfloor areas used as HVAC supply plenums. See Uniform Mechanical Code section 607 for underfloor supply plenum requirements. When foundation walls are insulated, the insulation shall be attached in a permanent manner. The insulation shall not block the airflow through foundation vents when installed. When foundation vents are not placed so that the top of the vent is below the lower surface of the floor insulation, a permanently attached baffle shall be installed at an angle of 30° from horizontal, to divert air flow below the lower surface of the floor insulation.

502.1.4.8 Slab-On-Grade: Slab-on-grade insulation, installed inside the foundation wall, shall extend downward from the top of the slab for a minimum distance of 24 inches or downward and then horizontally beneath the slab for a minimum combined distance of 24 inches. Insulation installed outside the foundation shall extend downward to a minimum of 24 inches or to the frostline. Above grade insulation shall be protected.

EXCEPTION: For monolithic slabs, the insulation shall extend downward from the top of the slab to the bottom of the footing.

502.1.4.9 Radiant Slabs: The entire area of a radiant slab shall be thermally isolated from the soil, with a minimum of R-10 insulation. The insulation shall be an approved product for its intended use. If a soil gas control system is present below the radiant slab, which results in increased convective flow below the radiant slab, the radiant slab shall be thermally isolated from the sub-slab gravel layer.

502.1.4.10 Below Grade Walls: Below grade exterior wall insulation used on the exterior (cold) side of the wall shall extend from the top of the below grade wall to the top of the footing and shall be approved for below grade use. Above grade insulation shall be protected.

Insulation used on the interior (warm) side of the wall shall extend from the top of the below grade wall to the below grade floor level.

502.1.5 Glazing and Door U-Values: Glazing and door U-values shall be determined in accordance with sections 502.1.5.1 and 502.1.5.2. All products shall be labeled with the NFRC certified or default U-value. The labeled U-value shall be used in all calculations to determine compliance with this Code. Sealed insulating glass shall conform to, or be in test for, ASTM E-774-81 class A.

502.1.5.1 Standard Procedure for Determination of Glazing U-Values: U-values for glazing shall be determined, certified and labeled in accordance with the National Fenestration Rating Council (NFRC) Product Certification Program (PCP), as authorized by an independent certification and inspection agency licensed by the NFRC. Compliance shall be based on Model Size AA. Product samples used for U-value determinations shall be production line units or representative of units as purchased by the consumer or contractor. Products that are listed in the NFRC Certified Products Directory or certified to the NFRC standard shall not use default values.

EXCEPTIONS:

1. Untested glazing products may be assigned default U-values from Table 10-6A.

2. Overhead glazing and units produced by a small business may be assigned default U-values from Table 10-6B.

3. Passive air inlets are not required to be part of the tested assembly.

4. Compliance for tested overhead glazing shall be based on NFRC Model Size BB.

502.1.5.2 Standard Procedure for Determination of Door U-Values: Half-lite and full-lite doors, including fire doors, shall be assigned default U-values from Table 10-6D. All other doors, including fire doors, shall be assigned default U-values from Table 10-6C.

EXCEPTIONS:

1. U-values determined, certified and labeled in accordance with the National Fenestration Rating Council (NFRC) Product Certification Program (PCP), as authorized by an independent certification and inspection agency licensed by the NFRC.

2. The default values for the opaque portions of doors shall be those listed in Table 10-6C, provided that the U-value listed for a door with a thermal break shall only be allowed if both the door and the frame have a thermal break.

3. One unlabeled or untested exterior swinging door with the maximum area of 24 square feet may be installed for ornamental, security or architectural purposes. Products using this exception shall not be included in either the U-value or glazing area calculation requirements.

502.1.6 Moisture Control:

502.1.6.1 Vapor Retarders: Vapor retarders shall be installed on the warm side (in winter) of insulation as specified in the following cases.

EXCEPTION: Vapor retarder installed with not more than 1/3 of the nominal R-value between it and the conditioned space.

502.1.6.2 Floors: Floors separating conditioned space from unconditioned space shall have a vapor retarder installed. The vapor retarder shall have a one perm dry cup rating or less (i.e., four mil[0.004 inch thick] polyethylene or kraft faced material).

502.1.6.3 Roof/Ceilings: Roof/ceiling assemblies where the ventilation space above the insulation is less than an average of 12 inches shall be provided with a vapor retarder. Faced batt insulation where used as a vapor retarder shall be face stapled. Single rafter joist vaulted ceiling cavities shall

be of sufficient depth to allow a minimum one inch vented air space above the insulation.

502.1.6.4: Vapor retarders shall not be required in roof/ceiling assemblies where the ventilation space above the insulation averages 12 inches or greater.

502.1.6.5: Vapor retarders shall not be required where all of the insulation is installed between the roof membrane and the structural roof deck.

502.1.6.6 Walls: Walls separating conditioned space from unconditioned space shall have a vapor retarder installed. Faced batt insulation shall be face stapled.

502.1.6.7 Ground Cover: A ground cover of six mil (0.006 inch thick) black polyethylene or approved equal shall be laid over the ground within crawl spaces. The ground cover shall be overlapped 12 inches minimum at the joints and shall extend to the foundation wall.

EXCEPTION: The ground cover may be omitted in crawl spaces if the crawl space has a concrete slab floor with a minimum thickness of 3-1/2 inches.

502.2 Thermal Criteria for Group R Occupancy:

502.2.1 UA Calculations: The proposed UA as calculated using Equations 2 and 3 shall not exceed the target UA as calculated using Equation 1. For the purpose of determining equivalent thermal performance, the glazing area for the target UA shall be calculated using figures in Table 5-1, and all the glazing shall be located in the wall area. The opaque door area shall be the same in the target UA and the proposed UA.

EXCEPTION: Log and solid timber walls that have a minimum average thickness of 3.5" and with space heat type other than electric resistance, are exempt from wall target UA and proposed UA calculations.

502.2.2 Space Heat Type: The following two categories comprise all space heating types:

1. Electric Resistance: Space heating systems which include baseboard units, radiant units and forced air units as either the primary or secondary heating system.

EXCEPTION: Electric resistance systems for which the total electric heat capacity in each individual dwelling unit does not exceed the greater of: 1) One thousand watts (1000 w) per dwelling unit, or; 2) One watt per square foot (1 w/ft^2) of the gross floor area.

2. Other: All gas, wood, oil and propane space heating systems, unless electric resistance is used as a secondary heating system, and all heat pump space heating systems. (See EXCEPTIONS, Electric Resistance, section 502.2.2 above.)

502.3 Reserved.

502.4 Air Leakage:

502.4.1 General: The requirements of this section shall apply to all buildings and structures, or portions thereof, and only to those locations separating outdoor ambient conditions from interior spaces that are heated or mechanically cooled.

502.4.2 Doors and Windows, General: Exterior doors and windows shall be designed to limit air leakage into or from the building envelope. Site-constructed doors and windows shall be sealed in accordance with Section 502.4.3.

502.4.3 Seals and Weatherstripping:

a. Exterior joints around windows and door frames, openings between walls and foundation, between walls and roof and wall panels; openings at penetrations of utility services through walls, floors and roofs; and all other openings in the building envelope for all occupancies and all other openings in between units in R-1 occupancy shall be sealed, caulked, gasketed or weatherstripped to limit air leakage.

b. All exterior doors or doors serving as access to an enclosed unheated area shall be weatherstripped to limit leakage around their perimeter when in a closed position.

c. Site built windows are exempt from testing but shall be made tight fitting. Fixed lights shall have glass retained by stops with sealant or caulking all around. Operating sash shall have weatherstripping working against overlapping trim and a closer/latch which will hold the sash closed. The window frame to framing crack shall be made tight with caulking, overlapping membrane or other approved technique.

d. Openings that are required to be fire resistive are exempt from this section.

502.4.4 Recessed Lighting Fixtures: When installed in the building envelope, recessed lighting fixtures shall meet one of the following requirements:

1. Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the unconditioned space.

2. Type IC rated, installed inside a sealed box constructed from a minimum 1/2 inch thick gypsum wall board, or constructed from a preformed polymeric vapor barrier, or other air tight assembly manufactured for this purpose.

3. Type IC rated, certified under ASTM E283 to have no more than 2.0 cfm air movement from the conditioned space to the ceiling cavity. The lighting fixture shall be tested at 75 Pascals or 1.57 lbs/ft^2 pressure difference and have a label attached, showing compliance.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0502, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0502, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0502, filed 12/19/91, effective 7/1/92. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0502, filed 12/19/90, effective 7/1/91.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 51-11-0503 Building mechanical systems.

503.1 General: This section covers the determination of design requirements, system and component performance, control requirements, insulating systems and duct construction.

EXCEPTION: Special applications, including but not limited to hospitals, laboratories, thermally sensitive equipment, and computer rooms may be exempted from the requirements of this section when approved by the building official.

503.2 Calculations of Heating and Cooling Loads, and System Sizing Limits: The design parameters specified in Chapter 3 shall apply for all computations.

503.2.1 Calculation Procedures: Heating and cooling design loads for the purpose of sizing HVAC systems are required and shall be calculated in accordance with accepted engineering practice, including infiltration and ventilation.

503.2.2 Space Heating and Space Cooling System Sizing Limits: Building mechanical systems for all buildings which provide space heating and/or space cooling shall be sized no greater than one hundred fifty percent of the heating and cooling design loads as calculated above.

EXCEPTIONS: The following limited exemptions from the sizing limit shall be allowed, however, in all cases heating and/or cooling design load calculations shall be submitted.

1. For equipment which provides both heating and cooling in one package unit, including heat pumps with electric heating and cooling and gas-pack units with gas heating and electric cooling, compliance need only be demonstrated for either the space heating or space cooling system size.

2. Natural gas- or oil-fired space heating equipment whose total rated space heating output in any one dwelling unit is fifty-six thousand Btu/h or less may exceed the one hundred fifty percent sizing limit provided that the installed equipment has an annual fuel utilization efficiency (AFUE) of not less than the sum of seventy-eight percent plus one percent for every five thousand Btu/h that the space heating equipment output exceeds the design heating load of the dwelling unit.

3. Stand-by equipment may be installed if controls and other devices are provided which allow redundant equipment to operate only when the primary equipment is not operating.

503.3 Simultaneous Heating and Cooling: Each temperature control zone shall include thermostatic controls installed and operated to sequence the use of heating and cooling energy to satisfy the thermal and/or humidity requirement of the zone. Controls shall prevent reheating (heating air that is cooler than system mixed air), recooling (cooling air that is warmer than the system mixed air), mixing or simultaneous supply of warm air (warmer than system return air mixed air) and cold air (cooler than system mixed air), or other simultaneous operation of heating and cooling systems to one zone. For the purposes of this section, system mixed air is defined as system return air mixed with the minimum ventilation air requirement by section 303.

EXCEPTIONS:

1. Variable air volume systems designed to reduce the air supply to each zone during periods of occupancy to the larger of the following:

a. Thirty percent or less of the peak supply volume.

b. The minimum allowed to meet ventilation requirements of section 303.

c. 0.5 cfm/ft^2 of zone conditioned area before reheating, recooling or mixing takes place. Consideration shall be given to supply air temperature reset control.

2. The energy for reheating, or providing warm air in mixing systems, is provided entirely from recovered energy that would otherwise be wasted, or from renewable energy sources. In addition, the system shall comply with section 503.7 without exception.

3. Areas where specific humidity levels are required to satisfy process needs.

4. Where special pressurization relationships or cross- contamination requirements are such that variable air volume systems are impractical, supply air temperatures shall be reset by representative building load or outside air temperature.

503.4 HVAC Equipment Performance Requirements:

503.4.1 Equipment Components:

503.4.1.1: The requirements of this section apply to equipment and mechanical component performance for heating, ventilating and air-conditioning systems. Equipment efficiency levels are specified. Data furnished by the equipment supplier or certified under a nationally recognized certification program or rating procedure shall be used to satisfy these requirements. Equipment efficiencies shall be based on the standard rating conditions in Tables 5-4, 5-5 or 5-6 as appropriate.

503.4.1.2: Where components from more than one manufacturer are assembled into systems regulated under this section, compliance for each component shall be as specified in sections 503.4.2 through 503.4.6 of this Code.

503.4.2: HVAC System Heating Equipment Heat Pump-heating Mode. Heat pumps whose energy input is entirely electric shall have a coefficient of performance (COP) heating, not less than the values in Table 5-7. Heat Pumps with supplementary backup heat other than electricity shall meet the requirements of Table 5-7.

503.4.2.1: These requirements apply to, but are not limited to, unitary (central) heat pumps (air source and water source) in the heating mode, water source (hydronic) heat pumps as used in multiple-unit hydronic HVAC systems, and heat pumps in the packaged terminal air-conditioner in the heating mode.

503.4.2.3 Supplementary Heater: The heat pump shall be installed with a control to prevent supplementary backup heater operation when the operating load can be met by the heat pump compression cycle alone.

503.4.2.4 Heat Pump Controls: Requirements for heat pump controls are listed in section 503.8.3.5 of this Code.

503.4.3 HVAC System Combustion Equipment: For Group R Occupancy, all gas, oil, and propane central heating systems shall have a minimum AFUE of 0.78*. All other Group R Occupancy heating equipment fueled by gas, oil, or propane shall be equipped with an intermittent ignition device, or shall comply with the efficiencies as required in the 1987 National Appliances Energy Conservation Act (Public Law 100-12).

* HVAC Heating system efficiency trade-offs shall be made using Chapters 4 or 6 of this Code.

503.4.4 Packaged and Unitary HVAC System Equipment, Electrically Operated, Cooling Mode: HVAC system equipment as listed below, whose energy input in the cooling mode is entirely electric, shall have an energy efficiency ratio (EER) or a seasonal energy efficiency ratio (SEER) cooling not less than values in Table 5-8.

503.4.4.1: These requirements apply to, but are not limited to, unitary (central) and packaged terminal heat pumps (air source and water source); packaged terminal air conditioners.

503.4.5 Reserved.

503.4.6 Reserved.

503.5 Reserved.

503.6 Balancing: The HVAC system design shall provide a means for balancing air and water systems. Balancing the system shall include, but not be limited to, dampers, temperature and pressure test connections and balancing valves.

503.7 Cooling with Outdoor Air (Economizer Cycle): Each fan system shall be designed to use up to and including one hundred percent of the fan system capacity for cooling with outdoor air automatically whenever its use will result in lower usage of new energy. Activation of economizer cycle shall be controlled by sensing outdoor air enthalpy or outdoor air dry-bulb temperature alone or alternate means approved by the building official.

EXCEPTIONS: Cooling with outdoor air is not required under any one or more of the following conditions:

1. The fan system capacity is less than three thousand five hundred cfm or total cooling capacity is less than ninety thousand Btu/h.

2. The quality of the outdoor air is so poor as to require extensive treatment of the air and approval by the building official.

3. The need for humidification or dehumidification requires the use of more energy than is conserved by the outdoor air cooling on an annual basis.

4. The use of outdoor air cooling may affect the operation of other systems so as to increase the overall energy consumption of the building.

5. When energy recovered from an internal/external zone heat recovery system exceeds the energy conserved by outdoor air cooling on an annual basis.

6. When all space cooling is accomplished by a circulating liquid which transfers space heat directly or indirectly to a heat rejection device such as a cooling tower without use of a refrigeration system.

7. When the use of one hundred percent outside air will cause coil frosting, controls may be added to reduce the quantity of outside air. However, the intent of this exception is to use one hundred percent air in lieu of mechanical cooling when less energy usage will result and this exception applies only to direct expansion systems when the compressor is running.

503.8 Controls:

503.8.1 Temperature Control: Each system shall be provided with at least one adjustable thermostat for the regulation of temperature. Each thermostat shall be capable of being set by adjustment or selection of sensors as follows:

503.8.1.1: When used to control heating only: Fifty-five degrees to seventy-five degrees F.

503.8.1.2: When used to control cooling only: Seventy degrees to eighty-five degrees F.

503.8.1.3: When used to control both heating and cooling, it shall be capable of being set from fifty-five degrees to eighty-five degrees F and shall be capable of operating the system heating and cooling in sequence. The thermostat and/or control system shall have an adjustable deadband of not less than ten degrees F.

503.8.2 Humidity Control: If a system is equipped with a means for adding moisture to maintain specific selected relative humidities in space or zones, a humidistat shall be provided. Humidistats shall be capable of being set to prevent new energy from being used to produce space-relative humidity above thirty percent.

EXCEPTION: Special uses requiring different relative humidities may be permitted when approved by the building official.

503.8.3 Zoning for Temperature Control:

503.8.3.1 One- and Two-Family Dwellings: At least one thermostat for regulation of space temperature shall be provided for each separate system. In addition, a readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to each zone or floor.

503.8.3.2 Multifamily Dwellings: For multifamily dwellings, each individual dwelling unit shall have at least one thermostat for regulation of space temperature. A readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to each room. Spaces other than living units shall meet the requirements of 503.8.3.3.

503.8.3.3 Reserved.

503.8.3.4 Control Setback and Shut-off:

1. Residential Occupancy Groups. One- and Two-Family and Multifamily dwellings—The thermostat required in section 503.8.3.1 or section 503.8.3.2, or an alternate means such as a switch or clock, shall provide a readily accessible, manual or automatic means for reducing the energy required for heating and cooling during the periods of nonuse or reduced need, such as, but not limited to unoccupied periods and sleeping hours. Lowering thermostat set points to reduce energy consumption of heating systems shall not cause energy to be expended to reach the reduced setting.

2. Reserved.

503.8.3.5 Heat Pump Controls: Programmable thermostats are required for all heat pump systems. The cut-on temperature for the compression heating shall be higher than the cut-on temperature for the supplementary heat, and the cut-off temperature for the compression heating shall be higher than the cut-off temperature for the supplementary heat. Heat pump thermostats will be capable of providing at least two programmable setback periods per day. The automatic setback thermostat shall have the capability of limiting the use of supplemental heat during the warm-up period.

503.9 Air Handling Duct System Insulation: Ducts, plenums and enclosures installed in or on buildings shall be thermally insulated per Table 5-11.

EXCEPTIONS: Duct insulation (except where required to prevent condensation) is not required in any of the following cases:

1. When the heat gain or loss of the ducts, without insulation, will not increase the energy requirements of the building.

2. Within the HVAC equipment.

3. Exhaust air ducts.

4. Supply or return air ducts installed in unvented crawl spaces with insulated walls, basements, or cellars in one- and two-family dwellings.

503.10 Duct Construction: All duct work shall be constructed in accordance with Standards RS-15, RS-16, RS-17, RS-18, RS-19 or RS-20, as applicable, and the Uniform Mechanical Code.

503.10.1: High-pressure and medium-pressure ducts shall be leak tested in accordance with the applicable standards in Chapter 7 of this Code with the rate of air leakage not to exceed the maximum rate specified in that standard.

503.10.2: When low-pressure supply air ducts are located outside of the conditioned space, all HVAC ductwork seams and joints, both longitudinal and transverse, shall be taped and sealed with products approved by the building official only. Ductwork joints shall be mechanically fastened with a minimum of three fasteners per joint for a cylindrical duct. Use Table 5- 11 for duct insulation requirements.

503.10.3: Requirements for Automatic or manual dampers are found in the Washington State Ventilation and Indoor Air Quality Code.

503.11 Piping Insulation: All piping installed to serve buildings (and within) shall be thermally insulated in accordance with Table 5-12. For service hot water systems see section 504.7. If water pipes are outside of conditioned space then the pipe insulation requirement shall be R-3 minimum for nonrecirculating hot and cold water pipes. For recirculating service hot and cold water pipes use Table 5-12 for pipe sizes and temperatures.

EXCEPTION: Piping insulation is not required within unitary HVAC equipment.

503.11.1 Other Insulation Thickness: Insulation thickness in Table 5-12 is based on insulation having thermal resistance in the range of 4.0 to 4.6 per inch of thickness on a flat surface at a mean temperature of seventy-five degrees F. Minimum insulation thickness shall be increased for materials having R-values less than 4.0 per inch, or may be reduced for materials having R-values greater than 4.6 per inch.

a. For materials with thermal resistance greater than R = 4.6 per inch, the minimum insulation thickness may be reduced as follows:

$$\frac{4.6 \times (\text{Table 5-12 Thickness})}{\text{Actual Resistance}} = \text{New Minimum Thickness}$$

b. For materials with thermal resistance less than R = 4.0 per inch, the minimum insulation thickness shall be increased as follows:

$$\frac{4.0 \times (\text{Table 5-10 Thickness})}{\text{Actual Resistance}} = \text{New Minimum Thickness}$$

c. Additional insulation with vapor barriers shall be provided to prevent condensation where required by the building official.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0503, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0503, filed 12/19/91, effective 7/1/92. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0503, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0504 Service water heating.

504.1 Scope: The purpose of this section is to provide criteria for design and equipment selection that will produce energy savings when applied to service water heating.

504.2 Water Heaters, Storage Tanks and Boilers:

504.2.1 Performance Efficiency: All Storage water heaters shall meet the requirements of the 1987 National Appliance Energy Conservation Act and be so labeled. All electric water heaters in unheated spaces or on concrete floors shall be placed on an incompressible, insulated surface with a minimum thermal resistance of R-10.

504.2.2 Insulation: Heat loss from unfired hot-water storage tanks shall be limited to a maximum of 9.6 Btu/hr/ft^2 of external tank surface area. The design ambient temperature shall be no higher than sixty-five degrees F.

504.2.3 Combination Service Water Heating/Space Heating Boilers: Service water heating equipment shall not be dependent on year round operation of space heating boilers.

EXCEPTIONS: 1. Systems with service/space heating boilers having a standby loss Btu/h less than:

$$(13.3 \text{ pmd} + 400)/n$$

determined by the fixture count method
where:

pmd = probably maximum demand in gallons/hour as determined in accordance with Chapter 37 of Standard RS-11.

n = fraction of year when outdoor daily mean temperature exceeds 64.9° F.

The standby loss is to be determined for a test period of twenty-four-hour duration while maintaining a boiler water temperature of ninety degrees F above an ambient of sixty degrees F and a five foot stack on appliance.

2. For systems where the use of a single heating unit will lead to energy savings, such unit shall be utilized.

504.3 Automatic Controls: Service water heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use. Temperature setting range shall be set to one hundred twenty degrees F or forty-nine degrees C.

504.4 Shutdown: A separate switch shall be provided to permit turning off the energy supplied to electric service water heating systems. A separate valve shall be provided to permit turning off the energy supplied to the main burner(s) of all other types of service water heater systems.

504.5 Swimming Pools:

504.5.1: All pool heaters shall be equipped with readily accessible ON/OFF switch to allow shutting off the operation of the heater without adjusting the thermostat setting. Controls shall be provided to allow the water temperature to be regulated from the maximum design temperature down to sixty-five degrees F.

504.5.2 Pool Covers: Heated swimming pools shall be equipped with a pool cover, approved by the building official.

504.6 Pump Operation: Circulating hot water systems shall be controlled so that the circulation pump(s) can be conveniently turned off, automatically or manually, when the hot water system is not in operation.

504.7 Pipe Insulation: For recirculating and non-recirculating systems, piping shall be thermally insulated in accordance with section 503.11 and Table 5-12.

504.8 Conservation of Hot Water:

504.8.1 Showers and Lavatories: Showers and lavatories used for other than safety reasons shall be equipped with flow control devices or specially manufactured showerheads or aerators to limit the total water flow rate as set forth in chapter 51-26 WAC, as measured with both hot and cold faucets turned on to their maximum flow.

504.8.2 Lavatories in Restrooms of Public Facilities:

504.8.2.1: Lavatories in restrooms of public facilities shall be equipped with a metering valve designed to close by spring or water pressure when left unattended (self-closing) and limit the flow rate as set forth in chapter 51-26 WAC.

EXCEPTION: Separate lavatories for physically handicapped persons shall not be equipped with self-closing valves.

504.8.2.2: Lavatories in restrooms of public facilities shall be equipped with devices which limit the outlet temperature to a maximum of one hundred ten degrees F.

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0504, filed 12/19/91, effective 7/1/92. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0504, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0505 Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0505, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0505, filed 12/19/91, effective 7/1/92. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0505, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0525 Equation 1—Group R Occupancy.

EQUATION 1 -- GROUP R OCCUPANCY
TARGET UA

$$UA_T = U_W A_W + U_{BGW} A_{BGW} + U_G A_G + U_F A_F + U_{RC} A_{RC} + U_{CC} A_{CC} + U_D A_D + F_S P_S$$

Where:

UA_T = the target combined thermal transmittance of the gross exterior wall, floor, and roof/ceiling assembly area.

U_W = the thermal transmittance value of the opaque above grade wall area found in Table 5-1.

A_W = opaque above grade wall area.

U_{BGW} = the thermal transmittance value of the below grade opaque wall area found in Table 5-1.

A_{BGW} = opaque below grade wall area.

U_G = the thermal transmittance value of the glazing area found in Table 5-1.

A_G = .15 (total floor area of the conditioned space).

U_F = the thermal transmittance value of the floor area found in Table 5-1.

A_F = floor area over unconditioned space.

U_{RC} = the thermal transmittance value of the roof/ ceiling area found in Table 5-1.

A_{RC} = roof/ceiling area.

U_{CC} = the thermal transmittance value of the cathedral ceiling area found in Table 5-1.

A_{CC} = cathedral ceiling area.

U_D = the thermal transmittance value of the opaque door area found in table 5-1.

A_D = opaque door area.

F_S = concrete slab component F-value found in Table 5-1.

P_S = Lineal ft. of concrete slab perimeter.

[Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0525, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0525, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0526 Equation 2—All occupancies.

EQUATION 2 -- ALL OCCUPANCIES

$$U = \frac{1}{r_o + R_1 + R_2 \ldots r_i}$$

Where:

U = the thermal transmittance of the assembly.

r_o = outside air film resistance.

r_o = .17 for all exterior surfaces.

r_i = inside air film resistance.

r_i = 0.61 for interior horizontal surfaces, heat flow up.

r_i = 0.92 for interior horizontal surfaces, heat flow down.

r_i = 0.68 for interior vertical surfaces.

$R = \frac{1}{C} = \frac{X}{K}$ = measure of the resistance to the passage of heat for each element.

C = conductance, the heat flow through a specific material of specific thickness.

K = insulation value of a material per inch.

X = the thickness of the material in inches.

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0526, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0527 Equation 3—Group R Occupancy.

EQUATION 3 -- GROUP R OCCUPANCY
PROPOSED UA

$$UA = U_W A_W + U_{BGW} A_{BGW} + U_G A_G + U_F A_F + U_{RC} A_{RC} + U_{CC} A_{CC} + U_D A_D + F_S P_S$$

Where:

UA = the combined thermal transmittance of the gross exterior wall, floor, and roof/ceiling assembly area.

U_W = the thermal transmittance of the opaque wall area.

U_{BGW} = the thermal transmittance value of the below grade opaque wall area.

A_{BGW} = opaque below grade wall area.

A_W = opaque wall area.

U_G = the thermal transmittance of the glazing (window or skylight) area.

A_G = glazing area, including windows in exterior doors.

U_F = the thermal transmittance of the floor area.

A_F = floor area over unconditioned space.

U_{RC} = the thermal transmittance of the roof/ceiling area.

A_{RC} = roof/ceiling area.

U_{CC} = the thermal transmittance of the cathedral ceiling area.

A_{CC} = cathedral ceiling area.

U_D = the thermal transmittance value of the opaque door area.

A_D = opaque door area.

F_S = concrete slab component f-factor.

P_S = lineal ft. of concrete slab perimeter.

NOTE: Where more than one type of wall, window, roof/ceiling, door, and skylight is used, the U and A terms for those items shall be expanded into sub-elements as:

$$U_{W1}A_{W1} + U_{W2}A_{W2} + U_{W3}A_{W3} + \ldots\text{etc.}$$

[Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0527, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0527, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0528 Equation 4—Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0528, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0528, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0529 Equation 5—Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0529, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0529, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0530 Table 5-1.

TABLE 5-1
TARGET COMPONENT VALUES FOR GROUP R OCCUPANCY

Component	Electric Resistance Climate Zone 1	Electric Resistance Climate Zone 2	Other Fuels Climate Zone 1	Other Fuels Climate Zone 2
Glazing % Floor Area	15%	15%	15%	15%
Glazing U-Factor	U = 0.400	U = 0.400	U = 0.650	U = 0.600
Doors	U = 0.200 (R-5)	U = 0.200 (R-5)	U = 0.400 (R-2.5)	U = 0.400 (R-2.5)
Ceilings				
Attic	U = 0.031 (R-38)	U = 0.031 (R-38)	U = 0.036 (R-30)	U = 0.031 (R-38)
Single Rafter/ Joist Vaulted	U = 0.034 (R-30)	U = 0.034 (R-30)	U = 0.034 (R-30)	U = 0.034 (R-30)
Walls	U = 0.058 (R-19A)	U = 0.044 (R-19+5A)	U = 0.062[1] (R-19)	U = 0.062[1] (R-19)
Floors	U = 0.029 (R-30)	U = 0.029 (R-30)	U = 0.041 (R-19)	U = 0.029 (R-30)
Slab on Grade Slab R-Value	F = 0.54 (R-10)	F = 0.54 (R-10)	F = 0.54 (R-10)	F = 0.54 (R-10)
Below Grade Interior				
Wall R-Value	R-19	R-19	R-19	R-19
2' Depth: Walls Slab	U = 0.043 F = 0.69	U = 0.043 F = 0.69	U = 0.043 F = 0.69	U = 0.043 F = 0.69
3.5' Depth: Walls Slab	U = 0.041 F = 0.64	U = 0.041 F = 0.64	U = 0.041 F = 0.64	U = 0.041 F = 0.64
7' Depth: Walls Slab	U = 0.037 F = 0.57	U = 0.037 F = 0.57	U = 0.037 F = 0.57	U = 0.037 F = 0.57
Below Grade Exterior				
Wall R-Value	R-10	R-12	R-10	R-12
2' Depth: Walls Slab	U = 0.070 F = 0.60	U = 0.061 F = 0.60	U = 0.070 F = 0.60	U = 0.061 F = 0.60
3.5' Depth: Walls Slab	U = 0.064 F = 0.57	U = 0.057 F = 0.57	U = 0.064 F = 0.57	U = 0.057 F = 0.57
7' Depth: Walls Slab	U = 0.056 F = 0.42	U = 0.050 F = 0.42	U = 0.056 F = 0.42	U = 0.050 F = 0.42

1. Log and Solid Timber walls that have a minimum average thickness of 3.5" are exempt from wall Target UA and Proposed UA calculations.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0530, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0530, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0531 Table 5-2—Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0531, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0531, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0532 Table 5-3—Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0532, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0532, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0533 Table 5-4.

HVAC SYSTEM HEATING EQUIPMENT (HEAT PUMPS)
ELECTRICALLY OPERATED STANDARD RATING CONDITIONS

		TYPE		
CONDITIONS		AIR SOURCE	WATER SOURCE	
Air entering equipment	°F	70°F(dry bulb)	70°F(dry bulb)	70°F(dry bulb)
Outdoor unit ambient	°F	47°F(dry bulb) /43°F(wet bulb)	17°F(dry bulb) /15°F(wet bulb)	----------
Entering water temp.	°F	----------	----------	60°F
Water flow rate		----------	----------	As used in cooling

Standard ratings are at sea level.

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0533, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0534 Table 5-5.

HVAC SYSTEM EQUIPMENT, ELECTRICALLY DRIVEN
STANDARD RATING CONDITIONS--COOLING

		TEMPERATURES			
		DRY BULB	WET BULB	INLET	OUTLET
Air entering equipment	°F	80°	67°	-----	-----
Condenser ambient (air cooled)	°F	95°	75°	-----	-----
Condenser water (water cooled)	°F	---	---	85°	95°

Standard ratings are at sea level.

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0534, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0535 Table 5-6.

APPLIED HVAC SYSTEM COMPONENTS ELECTRICALLY DRIVEN
STANDARD RATING CONDITIONS -- COOLING

ITEM	CENTRIFUGAL OR SELF-CONTAINED RECIPROCATING WATER CHILLER	CONDENSERLESS RECIPROCATING WATER-CHILLER
Water Temperature, °F		
Leaving chilled	44°	44°
Entering chilled	54°	54°
Leaving condenser	95°	--
Entering	85°	--
Fouling Factor, Water		
Nonferrous tubes	0.0005*	0.0005
Steel tubes	0.0010*	0.0010
Refrigerant	0.0000*	0.0000
Condenser Ambient (air/evap. cooled) °F	95°F (dry bulb) /75°F (wet bulb)	--
Compressor saturated discharge temperature		
Water cooled (evap. cooled) °F	--	105°
Air cooled °F	--	120°

Standard ratings at sea level.

* $hr \cdot ft^2 \cdot °F/Btu$

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0535, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0536 Table 5-7.

MINIMUM HEAT PUMP EFFICIENCIES, HEATING MODE[1]

SOURCE	MINIMUM COP	MINIMUM HSPF
Air Source:		
Split System	3.0[2]	6.8
Single Package System	3.0[2]	6.6
Water Source	3.8[3]	---
Ground ~~Water~~ Source	3.0[4]	---

[1] When tested at the standard rating specified in Table 5-4.

[2] When tested @ 47°F(dry bulb)/43°F(wet bulb)

[3] @ 70°F entering

[4] @ 50°F entering

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0536, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0537 Table 5-8.

MINIMUM EFFICIENCY FOR ELECTRIC HVAC EQUIPMENT, COOLING

	AIR COOLED		EVAP/WATER COOLED
STANDARD RATING CAPACITY	SEER	EER	EER
Under 65,000 Btu/hr. (19,050 watts)			
A. Split System	10.0	---	---
B. Single Package[3]	9.7	---	9.3[1]
65,000 Btu/hr. and over	----	8.9[2]	10.5[1]

[1] @ 80°F dry bulb / 67°F wet bulb

[2] @ 95°F dry bulb

[3] Prior to January 1, 1993 a minimum value of 8.0 SEER may be used.

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0537, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0538 Table 5-9—Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0538, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0538, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0539 Table 5-10—Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0539, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0539, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0540 Table 5-11.

TABLE 5-11
INSULATION OF DUCTS

DUCT LOCATION	CLIMATE ZONE	GROUP R OCCUPANCY HEATING OR COOLING DUCTS
On roof or on exterior of building	I	E and W
	II	D and W
Attic, garage, crawl space, in walls[1], in floor/ceiling[1]	I	E
	II	E
Within the conditioned space or in heated basement		None Required
In cement slab or in ground		B

Note: Where ducts are used for both heating and cooling, the minimum insulation shall be as required for the most restrictive condition.

[1] Insulation may be omitted on that portion of a duct which is located within a wall or floor-ceiling space where both sides of this space are exposed to conditioned air and where this space is not ventilated or otherwise exposed to unconditioned air.

[2] Vapor barriers shall be installed on conditioned air supply ducts in geographic areas where the average of the July, August, and September mean dewpoint temperature exceeds 60°F.

INSULATION TYPES: Minimum densities and out-of-package thickness.

A. 0.5-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket or equivalent to provide an installed total thermal resistance of at least R-2.

B. 2-inch 0.60 lb/cu. ft. mineral or glass fiber blanket 1.5-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 1.5-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-5.

C. 3-inch 0.60 lb/cu. ft. mineral or glass fiber blanket 2-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 2-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-7.

D. 4-inch 0.60 lb/cu. ft. mineral or glass fiber blanket 3-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 3-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-10.

E. 3.5 inch 0.60 lb/cu.ft. mineral or glass fiber blanket, 2.5 inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-8.

V. Vapor barrier, with perm rating not greater than 0.5 perm, all joints sealed.

W. Approved weatherproof barrier.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0540, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0540, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0541 Table 5-12.

MINIMUM PIPE INSULATION REQUIREMENTS*

PIPING SYSTEM	FLUID TEMP RANGE (°F)	INSULATION THICKNESS FOR GIVEN PIPE DIAMETERS[1]					
		LESS THAN 12 FOOT PIPE RUN[2] UP TO 2"	1" AND LESS	GREATER THAN 1" TO 2"	GREATER THAN 2" TO 4"	GREATER THAN 4" TO 6"	GREATER THAN 6" AND LARGER
HEATING & HOT WATER SYSTEMS							
Steam & Hot Water Pressure/temperature							
High	306°F ⇔ 450°F	1.5"	2.5"	2.5"	3.0"	3.5"	3.5"
Medium	251°F ⇔ 305°F	1.5"	2.0"	2.5"	2.5"	3.0"	3.0"
Low	201°F ⇔ 250°F	1.0"	1.5"	1.5"	2.0"	2.0"	2.0"
All Other	100°F ⇔ 200°F	0.5"	1.0"	1.0"	1.5"	1.5"	1.5"
Steam Condensate (for feed water)	Any	1.0"	1.0"	1.5"	2.0"	2.0"	2.0"
COOLING SYSTEMS							
Chilled Water	40°F ⇔ 55°F	0.5"	0.5"	0.75"	1.0"	1.0"	1.0"
Refrigerant/brine	Below 40°F	1.0"	1.0"	1.5"	1.5"	1.5"	1.5"

[1] For piping exposed to ambient air, increase thickness by 0.5".

[2] Pipe runouts not exceeding 12 feet in length to individual units, with a pipe diameter of less than 2 inches.

* Column headings for pipe diameters amended 5/30/90.

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0541, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0542 Table 5-13—Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0542, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0542, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0600 Chapter 6 building design by prescriptive requirements approach.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-06-065, § 51-11-0600, filed 3/1/91, effective 7/1/91.]

WAC 51-11-0601 Scope.

601.1 General: This chapter establishes design criteria in terms of prescribed requirements for building construction.

The provisions of this chapter are applicable to all Group R Occupancies. Occupancies shall comply with all the requirements of Chapter 5 except for the modifications herein specified.

The building envelope requirements of this chapter may be met by installing one of the prescriptive packages in Tables 6-1 to 6-6. Installed components shall meet the requirements of section 602 and 605. Compliance with nominal R-Values shall be demonstrated for the thermal resistance of the added insulation in framing cavities and/or insulated sheathing only and shall not include the thermal transmittance of other building materials or air films, but shall permit interruption by occasional framing members.

[Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0601, filed 2/10/94, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0601, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0602 Building envelope requirements for Group R Occupancy.

602.1 Roof/Ceiling: Ceilings below vented attics and single-rafter, joist-vaulted ceilings shall be insulated to not less than the nominal R-value specified for ceilings in Tables 6-1 to 6-6 as applicable.

602.2 Exterior Walls Both Above and Below Grade: Above grade exterior walls shall be insulated to not less than the nominal R-value specified in Tables 6-1 to 6-6 as applicable. The following walls should be considered to meet R-19 without additional documentation:

1. 2 x 6 framed and insulated with R-19 fiberglass batts.

2. 2 x 4 framed and insulated with R-13 fiberglass batts plus R-3.2 foam sheathing.

3. 2 x 4 framed and insulated with R-11 fiberglass batts plus R-5.0 foam sheathing.

602.3 Exterior Walls (Below Grade): Below grade exterior walls surrounding conditioned space shall be insulated to not less than the nominal R-value specified for below grade walls in Tables 6-1 to 6-6 as applicable.

602.4 Slab-on-grade Floors: Slab-on-grade floors shall be insulated along their perimeter to not less than the nominal R-values specified for slab-on-grade floors in Tables 6-1 to 6-6 as applicable. Slab insulation shall be installed in compliance with section 502.1.4.8. See Chapter 5, section 502.1.4.9, for additional requirements for radiant slab heating.

602.5 Floors Over Unconditioned Space: Floors over unconditioned spaces, such as vented crawl spaces, unconditioned basements, and parking garages shall be insulated to not less than the nominal R-value shown for floors over unconditioned spaces, in Tables 6-1 to 6-6.

602.6 Exterior Doors: Doors shall comply with Sections 602.6.1 and 602.6.2.

EXCEPTIONS:

1. Doors whose area and U-value are included in the calculations for compliance with the requirements for glazing in section 602.7 shall be exempt from the door U-value requirements prescribed in Tables 6-1 to 6-6.

2. One unlabeled or untested exterior swinging door with the maximum area of 24 square feet may be installed for ornamental, security or architectural purposes. Products using this exception shall not be included in either the U-value or glazing area calculation requirements.

602.6.1 Exterior Door Area: For half-lite and full-lite doors, the glazing area shall be included in calculating the allowed total glazing area in Section 602.7.1. Single glazing used for ornamental, security or architectural purposes shall be calculated using the exception to Section 602.7.2.

602.6.2 Exterior Door U-Value: Doors, including fire doors, shall have a maximum area weighted average U-value not exceeding that prescribed in Tables 6-1 to 6-6.

602.7 Glazing:

602.7.1 Glazing Area: The total glazing area as defined in Chapter 2 shall not exceed the percentage of gross conditioned floor area specified in Tables 6-1 to 6-6. This area shall also include any glazing in doors.

602.7.2 Glazing U-Value: The total glazing area as defined in Chapter 2 shall have an area weighted average U-value not to exceed that specified in Tables 6-1 to 6-6. U-values for glazing shall be determined in accordance with section 502.1.5.1. These areas and U-values shall also include any doors using the exception of section 602.6.

If the U-values for all glazing products are below the U-value specified, then no calculations are required. If compliance is to be achieved through an area weighted calculation, then the areas and U-values shall be included in the plans submitted with a building permit application.

EXCEPTION: Single glazing for ornamental, security, or architectural purposes shall have its area doubled and shall be included in the percentage of the total glazing area as allowed for in Tables 6-1 to 6-6. The maximum area (before doubling) allowed for the total of all single glazing is one percent of the floor area.

602.8 Air Leakage For Group R Occupancy: The minimum air leakage control measures shall be as specified in section 502.4 as applicable.

[Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0602, filed 2/10/94, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0602, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0603 Building mechanical systems for Group R Occupancy.

603.1: Group R Occupancies that are space heated by air-to-air, ground-to-air, or water-to-air heat pumps shall comply with Table 6-2 or 6-4 or 6-6 for other fuels. System sizing shall be determined by an analysis consistent with section 503.2 of this Code, or, when approved by the building official, Chapter 9. All mechanical equipment efficiencies and service water heating system efficiencies shall comply with standards as stated in sections 503 and 504 of this Code.

[Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0603, filed 2/10/94, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0603, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0604 Electric power and lighting for Group R Occupancy.

604.1: All electrical power and lighting systems shall comply with the requirements of section 505.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0604, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0605 Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0605, filed 10/18/93, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0605, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0606 Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0606, filed 10/18/93, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0606, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0607 Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0607, filed 10/18/93, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0607, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0608 Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0608, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0608, filed 12/19/91, effective 7/1/92. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0608, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0625 Table 6-1.

TABLE 6-1
PRESCRIPTIVE REQUIREMENTS[1] FOR GROUP R OCCUPANCY
CLIMATE ZONE 1 • HEATING BY ELECTRIC RESISTANCE

Option	Glazing % Floor Area	Glazing U-Value	Doors[9] U-Value	Ceiling[2]	Vaulted Ceiling[3]	Wall Above Grade	Wall• int[4] Below Grade	Wall• ext[4] Below Grade	Floor[5]	Slab[4] on Grade
I.	10%	0.46	0.40	R-38	R-30	R-21	R-21	R-10	R-30	R-10
II.	12%	0.43	0.20	R-38	R-30	R-19	R-19	R-10	R-30	R-10
III.	12%	0.40	0.40	R-38	R-30	R-21	R-21	R-10	R-30	R-10
IV.*	15%	0.40	0.20	R-38	R-30	R-19	R-19	R-10	R-30	R-10
V.	18%	0.39	0.20	R-38	R-30	R-21	R-21	R-10	R-30	R-10
VI.	21%	0.36	0.20	R-38	R-30	R-21	R-21	R-10	R-30	R-10
VII.[7]	25%	0.32[7]	0.20	R-38	R-30	R-19+R-5[8]	R-21	R-10	R-30	R-10
VIII.[7]	30%	0.29[7]	0.20	R-38	R-30	R-19+R-5[8]	R-21	R-10	R-30	R-10

* Reference Case

1 Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above may calculate compliance by Chapters 4 or 5 of this Code.

2 Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

3 Requirement applicable only to single rafter or joist vaulted ceilings.

4 Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See Section 602.2.

5 Floors over crawl spaces or exposed to ambient air conditions.

6 Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See Section 602.4.

7 The following options shall be applicable to buildings less than three stories: 0.35 maximum for glazing areas of 25% or less; 0.32 maximum for glazing areas of 30% or less.

8 This wall insulation requirement denotes R-19 wall cavity insulation plus R-5 foam sheathing.

9 Doors, including all fire doors, shall be assigned default U-values from Table 10-6C or 10-6D.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0625, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0625, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0625, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0626 Table 6-2.

TABLE 6-2
PRESCRIPTIVE REQUIREMENTS[1] FOR GROUP R OCCUPANCY
CLIMATE ZONE 1 • HEATING BY OTHER FUELS

Option	HVAC[9] Equip. Effic.	Glazing % Floor Area	Glazing U-Value	Doors[10] U-Value	Ceiling[2]	Vaulted Ceiling[3]	Wall Above Grade	Wall• int[4] Below Grade	Wall• ext[4] Below Grade	Floor[5]	Slab[6] on Grade
I.	Med.	10%	0.70	0.40	R-30	R-30	R-15	R-15	R-10	R-19	R-10
II.	Med.	12%	0.65	0.40	R-30	R-30	R-15	R-15	R-10	R-19	R-10
III.	High	21%	0.75	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
IV.*	Med.	21%	0.65	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
V.	Low	21%	0.60	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
VI.[7]	Med.	25%	0.45[7]	0.40	R-38	R-30	R-19	R-19	R-10	R-25	R-10
VII.[7]	Med.	30%	0.40[7]	0.40	R-30	R-30	R-19	R-19	R-10	R-25	R-10

* Reference Case

1 Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above may calculate compliance by Chapters 4 or 5 of this Code.

2 Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

3 Requirement applicable only to single rafter or joist vaulted ceilings.

4 Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See Section 602.2.

5 Floors over crawl spaces or exposed to ambient air conditions.

6 Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See Section 602.4.

7 The following options shall be applicable to buildings less than three stories: 0.50 maximum for glazing areas of 25% or less; 0.45 maximum for glazing areas of 30% or less.

8 This wall insulation requirement denotes R-19 wall cavity insulation plus R-5 foam sheathing.

9 Minimum HVAC Equipment efficiency requirement. 'Low' denotes an AFUE of 0.74. 'Med.' denotes an AFUE of 0.78. 'High' denotes an AFUE of 0.88. Minimum HVAC Equipment efficiency requirement for heat pumps. 'Low' denotes an HSPF of 6.35. 'Med' denotes an HSPF of 6.8. 'High' an HSPF of 7.7. Water and ground source heat pumps shall be considered as medium efficiency and have a minimum COP as required in Table 5-7.

10 Doors, including all fire doors, shall be assigned default U-values from Table 10-6C or 10-6D.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0626, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0626, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0626, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0627 Table 6-3.

TABLE 6-3
PRESCRIPTIVE REQUIREMENTS[1] FOR GROUP R OCCUPANCY CLIMATE ZONE 2 • HEATING BY ELECTRIC RESISTANCE

Option	Glazing % Floor Area	Glazing U-Value	Doors [10] U-value	Ceiling[2]	Vaulted Ceiling[3]	Wall Above Grade	Wall• int[4] Below Grade	Wall• ext[4] Below Grade	Floor[5]	Slab[6] on Grade
I.	10%	0.38	0.20	R-38	R-30	R-21	R-21	R-12	R-30	R-10
II.	12%	0.40	0.20	R-38	R-30	R-19+R-5[8]	R-21	R-12	R-25	R-10
III.*	15%	0.40	0.20	R-38	R-30	R-19+R-5[8]	R-21	R-12	R-30	R-10
IV.	18%	0.38	0.20	R-38	R-30	R-19+R-5[8]	R-21	R-12	R-30	R-10
V.[7]	21%	0.35	0.20	R-38Adv	R-38	R-19+R-5[8]	R-21	R-12	R-30	R-10
VI.[7]	25%	0.30[7]	0.20	R-49Adv	R-38	R-19+R-5[8]	R-21	R-12	R-30	R-10
VII.[7]	30%	0.28[7]	0.20	R-60Adv	R-38	R-21+R-7.5[9]	R-21	R-12	R-30	R-10

* Reference Case

1 Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above may calculate compliance by Chapters 4 or 5 of this Code.

2 Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

3 Requirement applicable only to single rafter or joist vaulted ceilings.

4 Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See Section 602.2.

5 Floors over crawl spaces or exposed to ambient air conditions.

6 Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See Section 602.4.

7 The following options shall be applicable to buildings less than three stories: 0.33 maximum for glazing areas of 25% or less; 0.31 maximum for glazing areas of 30% or less.

8 This wall insulation requirement denotes R-19 wall cavity insulation plus R-5 foam sheathing.

9 This wall insulation requirement denotes R-21 wall cavity insulation plus R-7.5 foam sheathing.

10 Doors, including all fire doors, shall be assigned default U-values from Table 10-6C or 10-6D.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0627, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0627, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0627, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0628 Table 6-4.

TABLE 6-4
PRESCRIPTIVE REQUIREMENTS[1] FOR GROUP R OCCUPANCY
CLIMATE ZONE 2 • HEATING BY OTHER FUELS

Option	HVAC[9] Equip. Effic.	Glazing % Floor Area	Glazing U-Value	Doors[10] U-Value	Ceiling[2]	Vaulted Ceiling[3]	Wall Above Grade	Wall• int[4] Below Grade	Wall• ext[4] Below Grade	Floor[5]	Slab[6] on Grade
I.	Med.	10%	0.70	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
II.	Med.	12%	0.65	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
III.	High	17%	0.65	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
IV.*	Med.	17%	0.60	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
V.	Low	17%	0.50	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VI.	Med.	21%	0.50	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VII.	Med.	25%	0.40[7]	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VIII.	Med.	30%	0.40[7]	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10

* Reference Case

1 Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above may calculate compliance by Chapters 4 or 5 of this Code.

2 Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

3 Requirement applicable only to single rafter or joist vaulted ceilings.

4 Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See Section 602.2.

5 Floors over crawl spaces or exposed to ambient air conditions.

6 Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See Section 602.4.

7 The following options shall be applicable to buildings less than three stories: 0.45 maximum for glazing areas of 25% or less; 0.40 maximum for glazing areas of 30% or less.

8 This wall insulation requirement denotes R-19 wall cavity insulation plus R-5 foam sheathing.

9 Minimum HVAC Equipment efficiency requirement. 'Low' denotes an AFUE of 0.74. 'Med.' denotes an AFUE of 0.78. 'High' denotes an AFUE of 0.88. Minimum HVAC Equipment efficiency requirement for heat pumps. 'Low' denotes an HSPF of 6.35. 'Med' denotes an HSPF of 6.8. 'High' an HSPF of 7.7. Water and ground source heat pumps shall be considered as medium efficiency and have a minimum COP as required in Table 5-7.

10 Doors, including all fire doors, shall be assigned default U-values from Table 10-6C or 10-6D.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0628, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0628, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0628, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0629 Table 6-5.

TABLE 6-5
LOG HOMES PRESCRIPTIVE REQUIREMENTS[1]
HEATING BY ELECTRIC RESISTANCE

Option	Average[2] Log Thickness	Glazing % Floor Area	Glazing U-Value	Doors[8] U-Value	Ceiling[3]	Vaulted[4] Ceiling	Floor[5]	Slab[6] on Grade
Climate Zone 1								
I.[7]	5.5"	15%	0.31	0.14	R-60 Adv	R-38	R-38	R-10
II.[7]	7.5"	15%	0.40	0.20	R-60 Adv	R-38	R-30	R-10
III.*	9.6"	15%	0.40	0.20	R-38	R-30	R-30	R-10
Climate Zone 2								
IV.[7]	6.7"	15%	0.31	0.14	R-60 Adv	R-38	R-38	R-10
V.[7]	8.7"	15%	0.40	0.14	R-60 Adv	R-38	R-38	R-10
VI.[7]	9.8"	15%	0.40	0.20	R-60 Adv	R-38	R-30	R-10
VII.[7]	10.5"	15%	0.40	0.20	R-49 Adv	R-38	R-30	R-10
VIII.*	13.5"	15%	0.40	0.20	R-38	R-30	R-30	R-10

* Reference Case

1 For Group R Occupancy use Table 6-5 for only the portion of floor area using log/solid timber walls. Use Tables 6-1 to 6-4 for all other portions of the floor area. Minimum requirements are for each option listed. Interpolations between options is not permitted. Proposed designs which cannot meet the specific requirements of a listed option above may calculate compliance by Chapters 4 or 5 of this Code.

2 Required minimum average log thickness.

3 'Adv' denotes Advanced Framing. Requirement applies to all ceilings except single rafter joist vaulted ceilings.

4 Requirement applicable only to single rafter joist vaulted ceilings.

5 Floors over crawl spaces or exposed to ambient air conditions.

6 Required slab perimeter insulation shall be water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications.

7 These options shall be applicable to buildings less than three stories.

8 Doors, including all fire doors, shall be assigned default U-values from Table 10-6C or 10-6D.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0629, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0629, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0629, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0630 Table 6-6.

TABLE 6-6
LOG HOMES PRESCRIPTIVE REQUIREMENTS[1]
HEATING BY OTHER FUELS

Climate Zone 1

Option	HVAC[9] Equip. Effic.	Glazing % Floor Area	Glazing U-Value	Doors[10] U-Value	Ceiling[2]	Vaulted Ceiling[3]	Wall Above Grade [11]	Wall• int[4] Below Grade	Wall• ext[4] Below Grade	Floor[5]	Slab[6] on Grade
I.	Med.	10%	0.70	0.40	R-30	R-30	R-15	R-15	R-10	R-19	R-10
II.	Med.	12%	0.65	0.40	R-30	R-30	R-15	R-15	R-10	R-19	R-10
III.	High	21%	0.75	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
IV.*	Med.	21%	0.65	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
V.	Low	21%	0.60	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
VI.[7]	Med.	25%	0.45[7]	0.40	R-38	R-30	R-19	R-19	R-10	R-25	R-10
VII.[7]	Med.	30%	0.40[7]	0.40	R-30	R-30	R-19	R-19	R-10	R-25	R-10

Climate Zone 2

Option	HVAC[9] Equip. Effic.	Glazing % Floor Area	Glazing U-Value	Doors[10] U-Value	Ceiling[2]	Vaulted Ceiling[3]	Wall Above Grade [11]	Wall• int[4] Below Grade	Wall• ext[4] Below Grade	Floor[5]	Slab[6] on Grade
I.	Med.	10%	0.70	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
II.	Med.	12%	0.65	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
III.	High	17%	0.65	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
IV.*	Med.	17%	0.60	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
V.	Low	17%	0.50	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VI.	Med.	21%	0.50	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VII.	Med.	25%	0.40[8]	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VIII.	Med.	30%	0.40[8]	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10

* Reference Case

1 Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above may calculate compliance by Chapters 4 or 5 of this Code.

2 Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

3 Requirement applicable only to single rafter or joist vaulted ceilings.

4 Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See Section 602.2.

5 Floors over crawl spaces or exposed to ambient air conditions.

6 Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See Section 602.4.

7 The following options shall be applicable to buildings less than three stories: 0.50 maximum for glazing areas of 25% or less; 0.45 maximum for glazing areas of 30% or less.

8 The following options shall be applicable to buildings less than three stories: 0.45 maximum for glazing areas of 25% or less; 0.40 maximum for glazing areas of 30% or less.

9 Minimum HVAC Equipment efficiency requirement. 'Low' denotes an AFUE of 0.74. 'Med.' denotes an AFUE of 0.78. 'High' denotes an AFUE of 0.88. Minimum HVAC Equipment efficiency requirement for heat pumps. 'Low' denotes an HSPF of 6.35. 'Med' denotes an HSPF of 6.8. 'High' an HSPF of 7.7. Water and ground source heat pumps shall be considered as medium efficiency and have a minimum COP as required in Table 5-7.

10 Doors, including all fire doors, shall be assigned default U-values from Table 10-6C or 10-6D.

11 Log and solid timber walls with a minimum average thickness of 3.5" are exempt from this insulation requirement.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0630, filed 12/21/94, effective 6/30/95. Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-0630, filed 2/10/94, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0630, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0631 Table 6-7—Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-0631, filed 10/18/93, effective 4/1/94. Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-0631, filed 12/19/91, effective 7/1/92.]

WAC 51-11-0700 Chapter 7—Standards.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0700, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0701 Standards. The standards and portions thereof, which are referred to in various parts of this code shall be part of the Washington State Energy Code and are hereby declared to be a part of this Code.

CODE STANDARD NO.	TITLE AND SOURCE
RS-1	1989 ASHRAE Handbook of Fundamentals
RS-2	Standard Method of Test for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors, Specification E283-84 of ASTM.
	Specifications for Aluminum Windows, ANSI A134.1, 1972.
	Specifications for Aluminum Sliding Glass Doors, ANSI A134.2, 1972.
	Industry Standard for Wood Window Units, NWWDA IS-2-87, Industry Standard for Wood Sliding Patio Doors, NWWDA IS-3-88.
RS-2B	AAMA 1503.1-88, 1988 Voluntary Test Method for Thermal transmittance of windows, doors and glazed wall sections.
RS-2C	ASTM C236-87 test for thermal conductance and transmittance of built-up sections by means of a guarded hot box; and ASTM C976-82 thermal performance of building assemblies by means of the calibrated hot box.
RS-3	ASHRAE Standard 62-89 Ventilation for Acceptable Indoor Air Quality.
RS-4	ASHRAE Standard 55-81 Thermal Environmental Conditions for Human Occupancy.
RS-5	DOE Test Procedures for Water Heaters, 10 CFR Part 430 Appendix E to Subpart B.
RS-6	Household Automatic Electric Storage-Type Water Heaters, ANSI C72.1-1972.
RS-7	Gas Water Heaters, Volume III, Circulating Tank, Instantaneous and Large Automatic Storage-Type Water Heaters, ANSI Z21.10.3, 1974.
RS-8	IES Lighting Handbook, Illuminating Engineering Society, 1984 Reference Volume, 1987 Application Volume.
RS-9	ASHRAE Standard 90.1-1989, Efficient Design of New Buildings Except New Low-Rise Residential Buildings.
RS-10	Standard for Packaged Terminal Air Conditioners, ARI Standard 310-90.
RS-11	1987 ASHRAE HVAC Systems and Applications Handbook.
RS-12	Energy Calculations I: Procedures for Determining Heating and Cooling Loads for Computerizing Energy Calculations—Algorithms for Building Heat Transfer Subsystems, ASHRAE 1975.
RS-13	Energy Calculations II: Procedures for Simulating the Performance of Components and Systems for Energy Calculations, 3rd Edition, ASHRAE 1975.
RS-14	Standard for Positive Displacement Refrigerant Compressor and Condensing Units, ARI Standard 520-74.
RS-15	1988 ASHRAE Equipment Handbook.
RS-16	Heating and Air Conditioning Systems—Installation Standards, SMACNA, February, 1977.
RS-17	SMACNA Duct Metal and Flexible Construction Standards, 1st Edition, Washington, D.C., 1985.
RS-18	Same as Standard RS-17.
RS-19	SMACNA Fibrous Glass Duct Construction Standards, 6th Edition, Washington, D.C., 1990.
RS-20	1990 ASHRAE Refrigeration Volume.
RS-21	Standard for Package Terminal Heat Pumps, ARI Standard 380-90.
RS-22	ASTM E779-87 Standard practice for measuring air leakage by the fan pressurization method.
RS-23	ASTM E741 Standard practice for measuring air leakage by the tracer dilution method.
RS-24	Standard 24 CFR Part 3280 HUD.
RS-25	Thermal Bridge in Sheet Metal Construction from Appendix E of RS-9.
RS-26	Super Good Cents Technical Reference

ACCREDITED AUTHORITATIVE AGENCIES

AAMA refers to the American Architectural Manufacturers Association, 35 East Wacker Drive, Chicago, IL 60601

ANSI refers to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018

ARI refers to the Air conditioning and Refrigeration Institute, 1815 North Fort Myer Drive, Arlington, VA 22209

ASHRAE refers to the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329

ASTM refers to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

IES refers to Illuminating Engineering Society, 345 East 47th Street, New York, NY 10017

NESCA refers to the National Environmental System Contractors Association, 1501 Wilson Blvd., Arlington, VA 22209

NWWDA refers to the National Wood Window and Door Association, 1400 East Toughy Avenue, Suite G-54, Des Plaines, IL 60018

SMACNA refers to the Sheet Metal and Air Conditioning contractors National Association, Inc., 8224 Old Courthouse Rd., Tysons Corner, Vienna, VA 22180

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0701, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0800 Section 0800—Suggested software for chapter 4 systems analysis approach for Group R occupancy.

Program Name:	Source
CALPAS 3	BERKELEY SOLAR GROUP 455 Santa Clara Ave. Oakland, CA 94610 (415) 843-7600
DATACAL	SUNRISE ENERGY, INC. 5708 43rd Ave E. Tacoma, WA 98443 (206) 922-5218
DOE 2	ACROSOFT INTERNATIONAL, INC. 9745 E. Hampten Ave. Suite 230 Denver, CO 80231 (303) 368-9225
F-LOAD	F-CHART SOFTWARE 4406 Fox Bluff Rd. Middleton, WI 53562 (608) 836-8536
MICROPAS	ENERCOMP 123 C Street Davis, CA 95616 (916) 753-3400
SUNDAY	ECOTOPE 2812 East Madison St. Seattle, WA 98112 (206) 322-3753
WATTSUN	WSEO 809 Legion Way S.E. Olympia, WA 98504 Attn: Hank Date (360) 956-2031

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0800, filed 12/19/90, effective 7/1/91.]

WAC 51-11-0900 Section 0900—Prescriptive heating system sizing. When using the prescriptive approach in Chapter 6, if approved by the building official, design heat load calculations are not required to show compliance to this Code if the heating system installed is equal to or less than the following:

Climate Zone 1	
Electric Resistance	21 Btu/h•ft²
Electric Resistance (Forced Air)	24 Btu/h•ft²
Other Fuels (Forced Air)	27 Btu/h•ft²
Climate Zone 2	
Electric Resistance	29 Btu/h•ft²
Electric Resistance (Forced Air)	32 Btu/h•ft²
Other Fuels (Forced Air)	39 Btu/h•ft²

Example: A 1500 ft² house in Zone 1, heated with gas, would not have to submit a design heat load if the proposed furnace is 40,500 Btu or less.

$$1500 \times 27 = 40{,}500$$

Disclaimer: All heating systems shall be designed and installed in accordance with Uniform Building Code Section 310.11.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-0900, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0900, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1000 Chapter 10.

Section 1000 Default heat-loss coefficients.

[Statutory Authority: Chapter 19.27A RCW. 92-01-140, § 51-11-1000, filed 12/19/91, effective 7/1/92. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1000, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1001 Section 1001 General.

1001.1 Scope: This chapter includes tables of seasonal average heat-loss coefficients for specified nominal insulation. The heat-loss coefficients may also be used for heating system sizing.

1001.2 Description: These coefficients were developed primarily from data and procedures from Standard RS-1, and taken specifically from Standard RS-26, listed in Chapter 7.

Coefficients not contained in this chapter may be computed using the procedures listed in these references if the assumptions in the following sections and Standard RS-26, listed in Chapter 7, are used, along with data from the sources referenced above.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1001, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1002 Section 1002: Below grade walls and slabs.

1002.1 General: Table 10-1 lists heat-loss coefficients for below-grade walls and floors.

Coefficients for below-grade walls are given as U-values (Btu/°F●hr per square foot of wall area). Coefficients for below-grade slabs are listed as F-values (Btu/°F●hr per lineal foot of slab perimeter).

Below-grade wall U-values are only valid when used with the accompanying below-grade slab F-value, and vice versa.

1002.2 Component Description: All below-grade walls are assumed to be eight-inch concrete. The wall is assumed

to extend from the slab upward to the top of the mud sill for the distance specified in Table 10-1, with six inches of concrete wall extending above grade.

Interior insulation is assumed to be fiberglass batts placed in the cavity formed by 2x4 framing on twenty-four inch centers with one-half inch of gypsum board as the interior finish material. Exterior insulation is assumed to be applied directly to the exterior of the below-grade wall from the top of the wall to the footing. The exterior case does not assume any interior framing or sheetrock.

In all cases, the entire wall surface is assumed to be insulated to the indicated nominal level with the appropriate framing and insulation application. Coefficients are listed for wall depths of two, three and one-half, and seven feet below grade. Basements shallower than two feet should use on-grade slab coefficients.

Heat-loss calculations for wall areas above grade should use above-grade wall U-values, beginning at the mudsill.

1002.3 Insulation Description: Coefficients are listed for the following four configurations:

1. Uninsulated: No insulation or interior finish.

2. Interior insulation: Interior 2x4 insulated wall without a thermal break between concrete wall and slab.

3. Interior insulation w/thermal break: Interior 2x4 insulated wall with R-5 rigid board providing a thermal break between the concrete wall and the slab.

4. Exterior insulation: Insulation applied directly to the exterior surface of the concrete wall.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 10-1 DEFAULT WALL U-VALUES AND SLAB F-VALUES FOR BASEMENTS

	Below Grade Wall U-value	Below Grade Slab F-value
2-Foot Depth Below Grade		
Uninsulated	0.350	0.59
R-11 Interior	0.066	0.68
R-11 Interior w/tb	0.070	0.60
R-19 Interior	0.043	0.69
R-19 Interior w/tb	0.045	0.61
R-10 Exterior	0.070	0.60
R-12 Exterior	0.061	0.60
3.5-Foot Depth Below Grade		
Uninsulated	0.278	0.53
R-11 Interior	0.062	0.63
R-11 Interior w/tb	0.064	0.57
R-19 Interior	0.041	0.64
R-19 Interior w/tb	0.042	0.57
R-10 Exterior	0.064	0.57
R-12 Exterior	0.057	0.57
7-Foot Depth Below Grade		
Uninsulated	0.193	0.46
R-11 Interior	0.054	0.56
R-11 Interior w/tb	0.056	0.42
R-19 Interior	0.037	0.57
R-19 Interior w/tb	0.038	0.43
R-10 Exterior	0.056	0.42
R-12 Exterior	0.050	0.42

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1002, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1003 Section 1003: On-grade slab floors.

1003.1 General: Table 10-2 lists heat-loss coefficients for heated on-grade slab floors, in units of Btu/°F●hr per lineal foot of perimeter.

1003.2 Component Description: All on-grade slab floors are assumed to be six-inch concrete poured directly onto the earth. The bottom of the slab is assumed to be at grade line. Monolithic and floating slabs are not differentiated.

Soil is assumed to have a conductivity of 0.75 Btu/hr●°F●ft². Slabs two-feet or more below grade should use basement coefficients.

1003.3 Insulation Description: Coefficients are provided for the following three configurations:

Two-Foot (or four-foot) vertical: Insulation is applied directly to the slab exterior, extending downward from the top of the slab to a depth of two-feet (or four-feet) below grade.

Two-Foot (or four-foot) horizontal: Insulation is applied directly to the underside of the slab, and run horizontally from the perimeter inward for two-feet or four-feet. The slab edge is exposed in this configuration.

Note: A horizontal installation with a thermal break of at least R-5 at the slab edge should use the vertical-case F-values.

Fully insulated slab: Insulation extends from the top of the slab, along the entire perimeter, and completely covers the area under the slab.

TABLE 10-2 DEFAULT F-VALUES FOR ON-GRADE SLABS

Insulation type	R-0	R-5	R-10	R-15
Uninsulated slab	0.73	—	—	—
2-ft Horizontal (No thermal break)	—	0.70	0.70	0.69
4-ft Horizontal (No thermal break)	—	0.67	0.64	0.63
2-ft Vertical (or Horiz. w/T.B.)	—	0.58	0.54	0.52
4-ft Vertical (or Horiz. w/T.B.)	—	0.54	0.48	0.45
Fully insulated slab	—	—	0.36	—

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1003, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1004 Section 1004: Crawlspace floors.

1004.1 General: Tables 10-3 and 10-4 list heat-loss coefficients for floors over crawlspaces in units of Btu/°F•hr per square foot of floor.

They are derived from procedures listed in RS-1, listed in Chapter 7, assuming an average outdoor temperature of 45° F, an average indoor temperature of 65° F, and a crawlspace area of one thousand three hundred fifty ft² and one hundred fifty ft of perimeter. The crawlspace is assumed to be 2.5-feet high, with twenty-four inches below grade and six inches above grade.

1004.2 Crawlspace Description: Four crawlspace configurations are considered: Vented, unvented, enclosed and heated plenum.

Vented crawlspaces: Assumed to have three air-changes per hour, with at least one ft² of net-free ventilation in the foundation for every three hundred ft² of crawlspace floor area. The crawlspace is not actively heated.

Floors over unheated areas, such as garages, may only use those values which have R-0 perimeter insulation.

Unvented crawlspaces: Assumed to have 1.5 air changes per hour, with less than one ft² of net-free ventilation in the foundation for every three hundred ft² of crawlspace floor area. The crawlspace is not actively heated. Floors over unheated basements may only use those values which have R-0 perimeter insulation.

Heated-plenum crawlspaces: Assumed to have 0.25 air-changes per hour, with no foundation vents. Heated supply air from central furnace is blown into a crawlspace and allowed to enter the living space unducted via holes cut into the floor.

Enclosed floors: Assumes no buffer space, and a covering of one-half inch of T1-11 on the exterior of the cavity exposed to the outside air.

1004.3 Construction Description: Floors are assumed to be either joisted floors framed on sixteen inch centers, or post and beam on four by eight foot squares. Insulation is assumed to be installed under the subflooring between the joists or beams with no space between the insulation and the subfloor. Insulation is assumed to be uncompressed.

Perimeter insulation is assumed to extend from the top of the rim joist to the crawlspace floor and then inward along the ground (on top of the ground cover) for at least twenty-four inches.

Floor coverings are assumed to be light carpet with rubber pad.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 10-3 DEFAULT U-VALUES FOR FLOORS OVER VENTED CRAWLSPACE OR UNHEATED BASEMENT

Nominal R-value		U-value	
Floor	Perimeter	Post & Beam	Joists
0	0	0.112	0.134
	11	0.100	0.116
	19	0.098	0.114
	30	0.093	0.107
11	0	0.052	0.056
	11	0.048	0.052
19	0	0.038	0.041
	11	0.036	0.038
22	0	0.034	0.037
	11	0.033	0.035
25	0	0.032	0.034
	11	0.031	0.033
30	0	0.028	0.029
	11	0.027	0.028
38	0	0.024	0.025
	11	0.024	0.024

TABLE 10-4 DEFAULT U-VALUES FOR FLOORS OVER HEATED PLENUM CRAWLSPACES

Nominal R-value Perimeter	U-value
11	0.085
19	0.075
30	0.069

Note: Crawlspaces used as heated plenums have approximately 30-percent higher heat-loss rate than unvented crawlspaces with the same assumed ACH. Default U-values in Table 10-4 reflect this higher rate of heat loss.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1004, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1005 Section 1005: Above-grade walls.

Section 1005.1 General: Table 10-5 lists heat-loss coefficients for the opaque portion of above-grade walls (Btu/°F●hr per square foot). They are derived from procedures listed in RS-1, listed in Chapter 7, assuming exterior air films at 7.5-mph wind speed.

Insulation is assumed to uniformly fill the entire cavity and to be installed as per manufacturer's directions. All walls are assumed to be finished on the inside with one-half inch gypsum wallboard, and on the outside with either beveled wood siding over one-half inch plywood sheathing or with five-eighths inch T1-11 siding. Insulated sheathing (either interior or exterior) is assumed to cover the entire opaque wall surface.

1005.2 Framing Description: Three framing types are considered, and defined as follows:

Standard: Studs framed on sixteen inch centers with double top plate and single bottom plate. Corners use three studs and each opening is framed using two studs. Headers consist of double 2X or single 4X material with an air space left between the header and the exterior sheathing. Interior partition wall/exterior wall intersections use two studs in the exterior wall.

Framing weighting factors:	Studs and plates	.19
	Insulated cavity	.77
	Headers	.04

Intermediate: Studs framed on sixteen inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and each opening is framed by two studs. Headers consist of double 2X material with R-10 insulation between the header and exterior sheathing. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall.

Framing weighting factors:	Studs and plates	.18
	Insulated cavity	.78
	Headers	.04

Advanced: Studs framed on twenty-four inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and one stud is used to support each header. Headers consist of double 2X material with R-10 insulation between the header and exterior sheathing. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall.

Framing weighting factors:	Studs and plates	.13
	Insulated cavity	.83
	Headers	.04

1005.3 Component Description: Default coefficients for three types of walls are listed: single-stud walls, strap walls, and double-stud walls.

Single-Stud Wall: Assumes either 2x4 or 2x6 studs framed on sixteen or twenty-four inch centers. Headers are solid for 2x4 walls and double 2x for 2x6 walls, with either dead-air or rigid-board insulation in the remaining space.

Strap Wall: Assumes 2x6 studs framed on sixteen or twenty-four inch centers. 2x3 or 2x4 strapping is run horizontally along the interior surface of the wall to provide additional space for insulation.

Double-Stud Wall: Assumes an exterior structural wall and a separate interior, non-structural wall. Insulation is placed in both wall cavities and in the space between the two walls. Stud spacing is assumed to be on twenty-four inch centers for both walls.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 10-5 DEFAULT U-VALUES FOR ABOVE-GRADE WALLS

2 x 4 Single Wood Stud: R-11 Batt

NOTE:
Nominal Batt R-value:
R-11 at 3.5-inch thickness

Installed Batt R-value:
R-11 in 3.5-inch cavity

R-value of Foam Board	Siding Material/Framing Type: Lapped Wood STD	Lapped Wood ADV	T1-11 STD	T1-11 ADV
0	.088	.084	.094	.090
1	.080	.077	.085	.082
2	.074	.071	.078	.075
3	.069	.066	.072	.070
4	.064	.062	.067	.065
5	.060	.058	.063	.061
6	.056	.055	.059	.057
7	.053	.052	.055	.054
8	.051	.049	.052	.051
9	.048	.047	.050	.049
10	.046	.045	.047	.046
11	.044	.043	.045	.044
12	.042	.041	.043	.042

2 x 4 Single Wood Stud: R-13 Batt

NOTE:
Nominal Batt R-value:
R-13 at 3.63-inch thickness

Installed Batt R-value:
R-12.7 in 3.5-inch cavity

R-value of Foam Board	Siding Material/Framing Type: Lapped Wood STD	Lapped Wood ADV	T1-11 STD	T1-11 ADV
0	.082	.078	.088	.083
1	.075	.072	.080	.076
2	.069	.066	.073	.070
3	.065	.062	.068	.065
4	.060	.058	.063	.061
5	.057	.055	.059	.057
6	.053	.052	.056	.054
7	.051	.049	.052	.051
8	.048	.047	.050	.048
9	.046	.045	.047	.046
10	.044	.043	.045	.044
11	.042	.041	.043	.042
12	.040	.039	.041	.040

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

2 x 4 Single Wood Stud: R-15 Batt

R-value of Foam Board	Siding Material/Framing Type: Lapped Wood STD	Lapped Wood ADV	T1-11 STD	T1-11 ADV
0	.076	.071	.081	.075
1	.069	.065	.073	.069
2	.064	.061	.068	.069
3	.060	.057	.063	.059
4	.056	.053	.059	.056
5	.053	.051	.055	.052
6	.050	.048	.052	.050
7	.047	.046	.049	.047
8	.045	.044	.047	.045
9	.043	.042	.044	.043
10	.041	.040	.042	.041
11	.039	.038	.041	.039
12	.038	.037	.039	.038

NOTE:
Nominal Batt R-value:
R-15 at 3.5-inch thickness

Installed Batt R-value:
R-15 in 3.5-inch cavity

2 x 6 Single Wood Stud: R-19 Batt

R-value of Foam Board	Siding Material/Framing Type: Lapped Wood STD	Lapped Wood INT	Lapped Wood ADV	T1-11 STD	T1-11 INT	T1-11 ADV
0	.062	.058	.055	.065	.061	.058
1	.058	.055	.052	.060	.057	.055
2	.054	.052	.050	.056	.054	.051
3	.051	.049	.047	.053	.051	.049
4	.048	.046	.045	.050	.048	.046
5	.046	.044	.043	.048	.046	.044
6	.044	.042	.041	.045	.044	.042
7	.042	.040	.039	.043	.042	.040
8	.040	.039	.038	.041	.040	.039
9	.038	.037	.035	.039	.038	.037
10	.037	.036	.035	.038	.037	.036
11	.036	.035	.034	.036	.035	.035
12	.034	.033	.033	.035	.034	.033

NOTE:
Nominal Batt R-value
R-19 at 6-inch thickness

Installed Batt R-Value
R-18 in 5.5-inch cavity

2 x 6 Single Wood Stud: R-21 Batt

		Siding Material/Framing Type					
	R-value of Foam Board	Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
NOTE: Nominal BATT R-value R-21 at 5.5-inch thickness Installed Batt R-value R-21 in 5.5-inch cavity	0	.057	.054	.051	.060	.056	.053
	1	.054	.051	.048	.056	.053	.050
	2	.050	.048	.045	.052	.050	.047
	3	.048	.045	.043	.049	.047	.045
	4	.045	.043	.041	.047	.045	.043
	5	.043	.041	.040	.044	.042	.041
	6	.041	.039	.038	.042	.041	.039
	7	.039	.038	.036	.040	.039	.037
	8	.038	.036	.035	.039	.037	.036
	9	.036	.035	.034	.037	.036	.035
	10	.035	.034	.033	.036	.035	.033
	11	.033	.033	.032	.034	.033	.032
	12	.032	.031	.031	.033	.032	.031

2 x 6 Single Wood Stud: R-22 Batt

		Siding Material/Framing Type					
	R-value of Foam Board	Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
NOTE: Nominal Batt R-value R-22 at 6.75-inch thickness Installed Batt R-value R-20 in 5.5-inch cavity	0	.059	.055	.052	.062	.058	.054
	1	.055	.052	.049	.057	.054	.051
	2	.052	.049	.047	.054	.051	.048
	3	.049	.046	.044	.050	.048	.046
	4	.046	.044	.042	.048	.046	.044
	5	.044	.042	.041	.045	.043	.042
	6	.042	.040	.039	.043	.042	.040
	7	.040	.039	.037	.041	.040	.038
	8	.038	.037	.036	.039	.038	.037
	9	.037	.036	.035	.038	.037	.035
	10	.035	.034	.033	.036	.035	.034
	11	.034	.033	.032	.035	.034	.033
	12	.033	.032	.031	.034	.033	.032

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2 x 6 Single Wood Stud: Two R-11 Batts

		Siding Material/Framing Type					
	R-value of Foam Board	Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
NOTE: Nominal Batt R-value R-22 at 7-inch thickness Installed Batt R-value R-18.9 in 5.5-inch cavity	0	.060	.057	.054	.063	.059	.056
	1	.056	.053	.051	.059	.056	.053
	2	.053	.050	.048	.055	.052	.050
	3	.050	.048	.046	.052	.049	.047
	4	.047	.045	.044	.049	.047	.045
	5	.045	.043	.042	.046	.045	.043
	6	.043	.041	.040	.044	.043	.041
	7	.041	.040	.038	.042	.041	.039
	8	.039	.038	.037	.040	.039	.038
	9	.038	.037	.036	.039	.038	.036
	10	.036	.035	.034	.037	.036	.035
	11	.035	.034	.033	.036	.035	.034
	12	.034	.033	.032	.034	.034	.033

2 x 8 Single Stud: R-25 Batt

		Siding Material/Framing Type					
	R-value of Foam Board	Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
NOTE: Nominal Batt R-value R-25 at 8-inch thickness Installed Batt R-value R-23.6 in 7.25-inch cavity	0	.051	.047	.045	.053	.049	.046
	1	.048	.045	.043	.049	.046	.044
	2	.045	.043	.041	.047	.044	.042
	3	.043	.041	.039	.044	.042	.040
	4	.041	.039	.037	.042	.040	.038
	5	.039	.037	.036	.040	.038	.037
	6	.037	.036	.035	.038	.037	.036
	7	.036	.035	.033	.037	.035	.034
	8	.035	.033	.032	.035	.034	.033
	9	.033	.032	.031	.034	.033	.032
	10	.032	.031	.030	.033	.032	.031
	11	.031	.030	.029	.032	.031	.030
	12	.030	.029	.028	.031	.030	.029

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

2 x 6: Strap Wall

	Siding Material/Frame Type			
	Lapped Wood		T1-11	
	STD	ADV	STD	ADV
R-19 + R-11 Batts	.036	.035	.038	.036
R-19 + R-8 Batts	.041	.039	.042	.040

2 x 6 + 2 x 4: Double Wood Stud

Batt Configuration			Siding Material/Frame Type			
			Lapped Wood		T1-11	
Exterior	Middle	Interior	STD	ADV	STD	ADV
R-19	------	R-11	.040	.037	.041	.038
R-19	------	R-19	.034	.031	.035	.032
R-19	R-8	R-11	.029	.028	.031	.029
R-19	R-11	R-11	.027	.026	.028	.027
R-19	R-11	R-19	.024	.023	.025	.023
R-19	R-19	R-19	.021	.020	.021	.020

2 x 4 + 2 x 4: Double Wood Stud

Batt Configuration			Siding Material/Frame Type			
			Lapped Wood		T1-11	
Exterior	Middle	Interior	STD	ADV	STD	ADV
R-11	------	R-11	.050	.046	.052	.048
R-19	------	R-11	.039	.037	.043	.039
R-11	R-8	R-11	.037	.035	.036	.036
R-11	R-11	R-11	.032	.031	.033	.032
R-13	R-13	R-13	.029	.028	.029	.028
R-11	R-19	R-11	.026	.026	.027	.026

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

Log Walls

NOTE:	Average Log Diameter	U-value
R-value of wood:	6-inch	0.148
R-1.25 per inch thickness	8-inch	0.111
Average wall thickness	10-inch	0.089
90% average log diameter	12-inch	0.074
	14-inch	0.063
	16-inch	0.056

Stress Skin Panel

NOTE:	Panel Thickness	U-value
R-value of	3 1/2-inch	.071
expanded polystyrene:	5 1/2-inch	.048
R-3.85/inch	7 1/4-inch	.037
	9 1/4-inch	.030
Framing: 6%	11 1/4-inch	.025
Spline: 8%		

No thermal bridging between interior and exterior splines

Single Metal Stud

Nominal Wall Thickness	Nominal Insulation R-Value	Effective Insulation R-Value	Stud Spacing 16" O.C.	Stud Spacing 24" O.C.
4 inch	R-11	R-11	.14	.13
4 inch	R-13	R-12.7	.13	.12
6 inch	R-19	R-18	.11	.10

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1005, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1006 Section 1006 Default U-values for glazing and doors.

1006.1 Untested Glazing and Doors: Untested glazing and doors shall be assigned the U-values from Tables 10-6A, 10-6B, 10-6C or 10-6D as appropriate.

TABLE 10-6A
Window Default Table

Description[1,2,3,4]		Frame Type[5,6]		
		Aluminum	Aluminum Thermal Break[7]	Wood/Vinyl
Single		1.20	1.20	1.20
Double, < 1/2"	Clear	0.92	0.75	0.63
	Clear + Argon	0.87	0.71	0.60
	Low-e	0.85	0.69	0.58
	Low-e + Argon	0.79	0.62	0.53
Double, ≥ 1/2"	Clear	0.86	0.69	0.58
	Clear + Argon	0.83	0.67	0.55
	Low-e	0.78	0.61	0.51
	Low-e + Argon	0.75	0.58	0.48
Triple,	Clear	0.70	0.53	0.43
	Clear + Argon	0.69	0.52	0.41
	Low-e	0.67	0.49	0.40
	Low-e + Argon	0.63	0.47	0.37

1 <1/2" = a minimum dead air space of less than 0.5 inches between the panes of glass.
≥1/2" = a minimum dead air space of 0.5 inches or greater between the panes of glass.

2 Any low-e (emissivity) coating (0.1, 0.2 or 0.4).

3 U-values listed for argon shall consist of sealed, gas-filled insulated units for argon, CO2, SF6, argon/SF6 mixtures and Krypton.

4 "Glass block" assemblies may use a U-value of 0.51.

5 Insulated fiberglass framed products shall use wood/vinyl U-values.

6 Aluminum clad wood windows shall use the U-values listed for wood/vinyl windows.

7 Aluminum Thermal Break = An aluminum thermal break framed window shall incorporate the following minimum design characteristics:

a) The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/hr/ft^2/degree F;

b) The thermal break material must produce a gap in the frame material of not less than 0.210 inches; and,

c) All metal framing members of the products exposed to interior and exterior air shall incorporate a thermal break meeting the criteria in a) and b) above.

TABLE 10-6B
APPROVED WINDOW AND SKYLIGHT DEFAULT TABLE[1]

	FRAME TYPE[7,8]			
DESCRIPTION[2,3,4,5,6]	ALUMINUM	ALUM. THERMAL BREAK[9]	WOOD/VINYL	ALUM. CLAD WOOD/REINFORCED VINYL[10]
Double, Clear ¼"	0.82	0.66	0.56	0.59
Double, Clear ¼" + argon	0.77	0.63	0.53	0.56
Double, Low-e4 ¼"	0.76	0.61	0.52	0.54
Double, Low-e2 ¼"	0.73	0.58	0.49	0.51
Double, Low-e1 ¼"	0.70	0.55	0.47	0.49
Double, Low-e4 ¼" + argon	0.70	0.55	0.47	0.49
Double, Low-e2 ¼" + argon	0.66	0.52	0.43	0.46
Double, Low-e1 ¼" + argon	0.64	0.50	0.41	0.43
Double, Clear 3/8"	0.78	0.63	0.54	0.57
Double, Clear 3/8" + argon	0.75	0.60	0.51	0.54
Double, Low-e4 3/8"	0.72	0.57	0.48	0.51
Double, Low-e2 3/8"	0.69	0.54	0.45	0.48
Double, Low-e1 3/8"	0.66	0.51	0.43	0.46
Double, Low-e4 3/8" + argon	0.68	0.53	0.44	0.47
Double, Low-e2 3/8" + argon	0.63	0.49	0.41	0.44
Double, Low-e1 3/8" + argon	0.61	0.47	0.39	0.41
Double, Clear ½"	0.75	0.60	0.50	0.54
Double, Clear ½" + argon	0.72	0.58	0.48	0.51
Double, Low-e4 ½"	0.68	0.53	0.44	0.47
Double, Low-e2 ½"	0.64	0.50	0.41	0.44
Double, Low-e1 ½"	0.61	0.47	0.39	0.42
Double, Low-e4 ½" + argon	0.65	0.50	0.42	0.44
Double, Low-e2 ½" + argon	0.60	0.46	0.37	0.40
Double, Low-e1 ½" + argon	0.58	0.43	0.35	0.38
Triple, Clear ¼"	0.66	0.52	0.42	0.44
Triple, Clear ¼" + argon	0.63	0.49	0.39	0.42
Triple, Low-e4 ¼"	0.64	0.50	0.40	0.40
Triple, Low-e2 ¼"	0.62	0.48	0.39	0.41
Triple, Low-e1 ¼"	0.61	0.47	0.38	0.40
Triple, Low-e4 ¼" + argon	0.60	0.46	0.37	0.39
Triple, Low-e2 ¼" + argon	0.58	0.43	0.34	0.37
Triple, Low-e1 ¼" + argon	0.57	0.42	0.34	0.36
Triple, Clear ½"	0.61	0.46	0.37	0.40
Triple, Clear ½" + argon	0.59	0.45	0.36	0.38
Triple, Low-e4 ½"	0.58	0.43	0.35	0.37
Triple, Low-e2 ½"	0.55	0.41	0.32	0.35
Triple, Low-e1 ½"	0.54	0.39	0.31	0.33
Triple, Low-e4 ½" + argon	0.55	0.41	0.32	0.35
Triple, Low-e2 ½" + argon	0.52	0.38	0.30	0.32
Triple, Low-e1 ½" + argon	0.51	0.37	0.29	0.31

Footnotes to Table 10-6B

1 Subtract 0.02 from the listed default U-value for non-aluminum spacer. Acceptable spacer materials may include but is not limited to fiberglass, wood and butyl or other material with an equivalent thermal performance.

2 1/4" = a minimum dead air space of 0.25 inches between the panes of glass.
3/8" = a minimum dead air space of 0.375 inches between the panes of glass.
1/2"= a minimum dead air space of 0.5 inches between the panes of glass.
Product with air spaces different than those listed above shall use the value for the next smaller air space; i.e. 3/4-inch = 1/2-inch U-values, 7/16-inch = 3/8-inch U-values, 5/16-inch = 1/4-inch U-values.

3 Low-e4 (emissivity) shall be 0.4 or less.
Low-e2 (emissivity) shall be 0.2 or less.
Low-e1 (emissivity) shall be 0.1 or less.

4 U-values listed for argon shall consist of sealed, gas-filled insulated units for argon, CO2, SF6, and argon/SF6 mixtures. The following conversion factor shall apply to Krypton gas-filled units: 1/4" or greater with krypton is equivalent to 1/2" argon.

5 Dividers placed between glazing: The U-value listed shall be used where the divider has a minimum gap of 1/8-inch between the divider and lite of each inside glass surface. Add 0.03 to the listed U-value for True Divided Lite windows.

6 "Glass block" assemblies may use a U-value of 0.51.

7 Insulated fiberglass framed products shall use wood/vinyl U-values.

8 Subtract 0.02 from the listed default values for solariums.

9 Aluminum Thermal Break = An aluminum thermal break framed window shall incorporate the following minimum design characteristics:

a) The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/hr/ft^2/F°;
b) The thermal break material must produce a gap in the frame material of not less than 0.210 inches; and,
c) All metal framing members of the products exposed to interior and exterior air shall incorporate a thermal break meeting the criteria in a) and b) above.

10 Aluminum clad wood windows shall use the U-values listed for Aluminum Clad Wood/Reinforced Vinyl windows. Vinyl clad wood window shall use the U-values listed for Wood/Vinyl windows. Any vinyl frame window with metal reinforcement in more than one rail shall use the U-values listed for Aluminum Clad Wood/Reinforced Vinyl window.

TABLE 10-6C
TRANSMISSION COEFFICIENTS (U) FOR WOOD AND STEEL DOORS
Btu/h · ft^2 · F

Nominal Door Thickness, Inches	Description	No Storm Door	Wood Storm Door[c]	Metal Storm Door[d]
Wood Doors[b]				
1-3/8	Panel door with 7/16 inch panels[e]	0.57	0.33	0.37
1-3/8	Hollow core flush door	0.47	0.30	0.32
1-3/8	Solid core flush door	0.39	0.26	0.28
1-3/4	Panel door with 7/16 inch panels[e]	0.57	0.33	0.36
1-3/4	Hollow core flush door	0.46	0.29	0.32
1-3/4	Panel door with 3/4 inch panels[e]	0.40	0.27	0.29
1-3/4	Panel door with 1-1/8 inch panels[e]	0.39	0.26	0.28
1-3/4	Solid core flush door	0.33	0.28	0.25
2-1/4	Solid core flush door	0.27	0.20	0.21
Steel Doors[b]				
1-3/4	Fiberglass or mineral wool core w/ steel stiffeners, no thermal break[f]	0.60	---	---
1-3/4	Paper honeycomb core without thermal break[f]	0.56	---	---
1-3/4	Solid urethane foam core without thermal break[a]	0.40	---	---
1-3/4	Solid fire rated mineral fiberboard core without thermal break[f]	0.38	---	---
1-3/4	Polystyrene core without thermal break (18 gage commercial steel)[f]	0.35	---	---
1-3/4	Polyurethane core without thermal break (18 gage commercial steel)[f]	0.29	---	---
1-3/4	Polyurethane core without thermal break (24 gage commercial steel)[f]	0.29	---	---
1-3/4	Polyurethane core w/ thermal break & wood perimeter (24 gage commercial steel)[f]	0.20	---	---
1-3/4	Solid urethane foam core with thermal break	0.19	0.16	0.17

Note: All U-values for exterior doors in this table are for doors with no glazing, except for the storm doors which are in addition to the main exterior door. Any glazing area in exterior doors should be included with the appropriate glass type and analyzed. Interpolation and moderate extrapolation are permitted for door thicknesses other than those specified.

a Values are based on a nominal 32 by 80 in. door size with no glazing.
b Outside air conditions: 15 mph wind speed, 0°F air temperature; inside air conditions: natural convection, 70°F air temperature.
c Values for wood storm door are for approximately 50 percent glass area.
d Values for metal storm door are for any percent glass area.
e 55 percent panel area.
f ASTM C 236 hotbox data on a nominal 3 by 7 ft door size with no glazing.

The U-values in Table 6C are for exterior wood and steel doors. The values given for wood doors were calculated, and those for steel doors were taken from hotbox tests (Sabine et al. 1975: Yellot 1965) or from manufacturer's test reports. An outdoor surface conductance of 6.0 Btu/h • ft^2 • °F was used, and the indoor surface conductance was taken as 1.4 Btu/h • ft^2 • °F for vertical surfaces with horizontal heat flow. All values given are for exterior doors without glazing. If an exterior door contains glazing, refer to Table 10-6D.

TABLE 10-6D
APPROVED GLAZED DOOR DEFAULT U-VALUES[2]

Description[2,3,4,5]	Door Material			
	Insulated[6]		Wood[7]	
	Full-Lite[4,9]	Half-Lite[10,11]	Full-Lite[3]	Half-Lite[10]
Double, Clear 1/4"	0.39	0.31	0.47	0.42
Double, Clear 1/4" + argon	0.37	0.30	0.45	0.41
Double, Low-e4 1/4"	0.36	0.30	0.44	0.41
Double, Low-e2 1/4"	0.35	0.29	0.43	0.40
Double, Low-e1 1/4"	0.24	0.28	0.41	0.39
Double, Low-e4 1/4" + argon	0.33	0.28	0.41	0.39
Double, Low-e2 1/4" + argon	0.31	0.26	0.39	0.38
Double, Low-e1 1/4" + argon	0.31	0.26	0.38	0.37
Double, Clear 3/8"	0.37	0.30	0.45	0.41
Double, Clear 3/8" + argon	0.36	0.29	0.44	0.41
Double, Low-e4 3/8"	0.34	0.28	0.42	0.40
Double, Low-e2 3/8"	0.33	0.28	0.41	0.39
Double, Low-e1 3/8"	0.21	0.26	0.38	0.37
Double, Low-e4 3/8" + argon	0.32	0.27	0.40	0.38
Double, Low-e2 3/8" + argon	0.29	0.25	0.37	0.37
Double, Low-e1 3/8" + argon	0.29	0.25	0.36	0.36
Double, Clear 1/2"	0.36	0.29	0.44	0.41
Double, Clear 1/2" + argon	0.34	0.28	0.42	0.40
Double, Low-e4 1/2"	0.32	0.27	0.40	0.38
Double, Low-e2 1/2"	0.30	0.26	0.38	0.37
Double, Low-e1 1/2"	0.29	0.25	0.36	0.36
Double, Low-e4 1/2" + argon	0.30	0.26	0.38	0.37
Double, Low-e2 1/2" + argon	0.28	0.25	0.36	0.36
Double, Low-e1 1/2" + argon	0.28	0.24	0.34	0.35
Triple, Clear 1/4"	0.31	0.26	0.39	0.38
Triple, Clear 1/4" + argon	0.29	0.25	0.37	0.37
Triple, Low-e4 1/4"	0.30	0.26	0.38	0.37
Triple, Low-e2 1/4"	0.29	0.25	0.37	0.36
Triple, Low-e4 1/4" + argon	0.27	0.24	0.35	0.35
Triple, Low-e2 1/4" + argon	0.26	0.24	0.34	0.35

Footnotes to Table 10-6D

1 Subtract 0.02 from the listed default U-value for insulated spacers. Insulated spacer material includes fiberglass, wood and butyl or other material with an equivalent Thermal performance.

2 1/4" = a minimum dead air space of 0.25 inches between the panes of glass.
3/8" = a minimum dead air space of 0.375 inches between the panes of glass.
1/2" = a minimum dead air space of 0.5 inches between the panes of glass.
Products with air spaces different than those listed above shall use the value for next smaller air space; i.e. 3/4-inch = 1/2-inch U-values, 7/16-inch = 3/8-inch U-values, 5/16-inch = 1/4-inch U-values.

3 Low-e4 (emissivity) shall be 0.4 or less.
Low-e2 (emissivity) shall be 0.2 or less.
Low-e1 (emissivity) shall be 0.1 or less.

4 U-values listed for argon shall consist of sealed, gas-filled, insulated units for argon, CO2, SF6, and argon/SF6 mixtures.
The following conversion factor shall apply to Krypton gas-filled units:
1/4-inch or greater airspace of Krypton gas-fill = 1/2-inch air space Argon gas-fill.

5 Dividers placed between glazing: The U-values listed shall be used where the divider has a minimum gap of 1/8-inch between the divider and lite of each inside glass surface. Add 0.03 to the listed U-value for True Divided Lite windows.

6 Insulated = Any urethane insulated foam core door with a thermal break. Thermal Break = A thermal break door shall incorporate the following design characteristics:
a) The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/hr•ft^2•°F; and
b) The thermal break material shall not be less than 0.210 inches.

7 Wood = any wood door.

8 Full-Lite = A door that consists of more than 50 percent glazing.

9 Add 0.05 to the listed U-value for Full-Lite values if the insulated door does not have a thermal break.

10 Half-Lite = A door that consists of 50 percent or less glazing.

11 Add 0.06 to the listed U-value for Half-Lite values if the insulated door does not have a thermal break.

[Statutory Authority: Chapters 19.27, 19.27A and 34.05 RCW. 94-05-059, § 51-11-1006, filed 2/10/94, effective 4/1/94. Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1006, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1007 (Reserved.)

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1007, filed 12/19/90, effective 7/1/91.]

WAC 251-11-1008 Section 1007 Ceilings.

1007.1 General: Table 10-7 lists heat-loss coefficients for the opaque portion of exterior ceilings below vented attics, vaulted ceilings, and roof decks in units of Btu/°F●hr per square foot of ceiling.

They are derived from procedures listed in RS-1, listed in Chapter 7. Ceiling U-values are modified for the buffering effect of the attic, assuming an indoor temperature of 65° F and an outdoor temperature of 45° F.

1007.2 Component Description: The three types of ceilings are characterized as follows:

Ceilings Below a Vented Attic: Attic insulation is assumed to be blown-in, loose-fill fiberglass with a K-value of 2.6 hr●°F●ft²/Btu per inch. Full bag count for specified R-value is assumed in all cases. Ceiling dimensions for flat ceiling calculations are forty-five by thirty feet, with a gabled roof having a 4/12 pitch. The attic is assumed to vent naturally at the rate of three air changes per hour through soffit and ridge vents. A void fraction of 0.002 is assumed for all attics with insulation baffles. Standard-framed, unbaffled attics assume a void fraction of 0.008.

Attic framing is either standard or advanced. Standard framing assumes tapering of insulation depth around the perimeter with resultant decrease in thermal resistance. An increased R-value is assumed in the center of the ceiling due to the effect of piling leftover insulation. Advanced framing assumes full and even depth of insulation extending to the outside edge of exterior walls. Advanced framing does not change from the default value.

U-Values for flat ceilings below vented attics with standard framing may be modified with the following table:

	U-Value for Standard Framing	
Roof Pitch	R-30	R-38
4/12	.036	.031
5/12	.035	.030
6/12	.034	.029
7/12	.034	.029
8/12	.034	.028
9/12	.034	.028
10/12	.033	.028
11/12	.033	.027
12/12	.033	.027

Vented scissors truss attics assume a ceiling pitch of 2/12 with a roof pitch of either 4/12 or 5/12. Unbaffled standard framed scissors truss attics are assumed to have a void fraction of .016.

Vaulted Ceilings: Insulation is assumed to be fiberglass batts installed in roof joist cavities. In the vented case, at least 1.5-inches between the top of the batts and the underside of the roof sheathing is left open for ventilation in each cavity. A ventilation rate of three air changes per hour is assumed. In the unvented or dense pack case, the ceiling cavity is assumed to be fully packed with insulation, leaving no space for ventilation.

Roof Decks: Rigid insulation is applied to the top of roof decking with no space left for ventilation. Roofing materials are attached directly on top of the insulation. Framing members are often left exposed on the interior side.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 10-7 DEFAULT U-VALUES FOR CEILINGS

Ceilings Below Vented Attics	Standard Frame	Advanced Frame
Flat Ceiling	Baffled	
R-19	0.049	0.047
R-30	0.036	0.032
R-38	0.031	0.026
R-49	0.027	0.020
R-60	0.025	0.017
Scissors Truss		
R-30 (4/12 roof pitch)	0.043	0.031
R-38 (4/12 roof pitch)	0.040	0.025
R-49 (4/12 roof pitch)	0.038	0.020
R-30 (5/12 roof pitch)	0.039	0.032
R-38 (5/12 roof pitch)	0.035	0.026
R-49 (5/12 roof pitch)	0.032	0.020

Vaulted Ceilings	16" O.C.	24" O.C.
Vented		
R-19 2x10 joist	0.049	0.048
R-30 2x12 joist	0.034	0.033
R-38 2x14 joist	0.027	0.027
Unvented		
R-30 2x10 joist	0.034	0.033
R-38 2x12 joist	0.029	0.027
R-21 + R-21 2x12 joist	0.026	0.025

Roof Deck	4x Beams, 48" O.C.
R-12.5 2" Rigid insulation	0.064
R-21.9 3.5" Rigid insulation	0.040
R-37.5 6" Rigid insulation	0.025
R-50 8" Rigid insulation	0.019

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1008, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1009 Section 1008 Air infiltration.

1008.1 General: Tables 10-8 and 10-9 list effective air-change rates and heat capacities for heat loss due to infiltration.

Estimated seasonal average infiltration rate in air changes per hour (ACH) is given for standard air-leakage control (see section 502.4 Air Leakage for All Occupancies). The effective air-change rate shall be used in calculations for compliance under either the Component Performance or Systems Analysis approaches.

Heat loss due to infiltration shall be computed using the following equation:

$$Q_{infil} = ACH_{eff} * HCP$$

where: Q_{infil} = Heat loss due to air infiltration

ACH_{eff} = the effective infiltration rate in Table 10-8

HCP = the Heat Capacity Density Product for the appropriate elevation or climate zone as given below.

TABLE 10-8 ASSUMED EFFECTIVE AIR-CHANGES PER HOUR

Air-Leakage Control Package	Air-Changes per Hour Natural	Effective
Standard	0.35	0.35

TABLE 10-9 DEFAULT HEAT CAPACITY/DENSITY PRODUCT FOR AIR

Zone	Average Elevation	Heat Capacity/Density
1	Mean Sea Level	0.0180 Btu/hr•°F
2	2000	0.0168 Btu/hr•°F
3	3000	0.0162 Btu/hr•°F

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1009, filed 12/19/90, effective 7/1/91.]

WAC 51-11-1010 Section 1009 Mass.

1009.1 General: Table 10-10 lists default mass-values for residential construction types. All calculations are based on standard ASHRAE values for heat-storage capacity as listed in RS-1 Chapter 22.

Thermal capacity of furniture is ignored, as is heat storage beyond the first four inches of mass thickness. All mass is assumed to be in direct contact with the conditioned space. Concrete separated from the heated volume by other materials must multiply the listed concrete mass value by the result of the following formula:

Ln(R-value) x (-.221) + 0.5

Where:

Ln = Natural log

R-value = R-value of material covering concrete

Note: All default values for covered concrete slabs have been adjusted according to this procedure.

1009.2 Mass Description: Mass is divided into two types: Structural and additional.

Structural Mass: Includes heat-storage capacity of all standard building components of a typical residential structure, including floors, ceilings, and interior and exterior walls in Btu/°F●ft² of floor area. It also assumes exterior wall, interior wall and ceiling surface area approximately equals three times the floor area.

Additional Mass: Includes any additional building material not part of the normal structure, which is added specifically to increase the building's thermal-storage capability. This category includes masonry fireplaces, water or trombe walls, and extra layers of sheetrock. Coefficients are in Btu/°F●ft² of surface area of material exposed to conditioned space. The coefficient for water is Btu/°F●gallon.

1009.3 Component Description: Light frame assumes one inch thick wood flooring with five-eighths inch sheetrock on ceilings and interior walls, and walls consisting of either five-eighths inch sheetrock or solid logs. Slab assumes a four-inch concrete slab on or below grade, with five-eighths inch sheetrock on exterior and interior walls and ceiling, and with separate values for interior or exterior wall insulation. Adjustments for slab covering is based on R-value of material. Additional mass values are based on the density multiplied by the specific heat of the material adjusted for listed thickness.

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TABLE 10-10 DEFAULT MASS VALUES

Structural Mass M-value	Btu/°F·Ft² floor area
Light frame:	
Joisted/post & beam floor, sheetrock walls and ceilings	3.0
Joisted/post & beam floor, log walls, sheetrock ceilings	4.0
Slab with interior wall insulation:	
Slab, no covering or tile, sheetrock walls and ceilings	10.0
Slab, hardwood floor covering, sheetrock walls and ceilings	7.0
Slab, carpet and pad, sheetrock walls and ceilings	5.0
Slab with exterior wall insulation:	
Slab, no covering or tile, sheetrock walls and ceilings	12.0
Slab, hardwood floor covering, sheetrock walls and ceilings	9.0
Slab, carpet and pad, sheetrock walls and ceilings	7.0
Additional Mass M-Value:	BTU/°F·Ft² surface area
Gypsum wallboard, 1/2-inch thickness	0.54
Gypsum wallboard, 5/8-inch thickness	0.68
Hardwood floor	1.40
Concrete/Brick, 4 inch-thickness	10.30
Concrete/Brick, 6 inch-thickness	15.40
	BTU/°F·gallon
Water, 1 gallon	8.0

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1010, filed 12/19/90, effective 7/1/91.]

CHAPTER 11
ADMINISTRATION AND ENFORCEMENT

WAC 51-11-1100 Title. Chapters 11 through 20 of this Code shall be known as the "Washington State Nonresidential Energy Code" and may be cited as such; and will be referred to hereafter as "this Code."

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1100, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1110 Purpose and intent. The purpose of this Code is to provide minimum standards for new or altered buildings and structures or portions thereof to achieve efficient use and conservation of energy. It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques to achieve efficient use and conservation of energy.

The purpose of this Code is not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefitted by the terms of this Code. This Code is not intended to abridge any safety or health requirements required under any other applicable codes or ordinances.

The provisions of this Code do not consider the efficiency of various energy forms as they are delivered to the building envelope.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1110, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1120 Scope. This Code sets forth minimum requirements for the design of new or altered buildings and structures or portions thereof that provide facilities or shelter for public assembly, educational, business, mercantile, institutional, storage, factory, and industrial

occupancies by regulating their exterior envelopes and the selection of their HVAC, service water heating, electrical distribution and illuminating systems and equipment for efficient use and conservation of energy.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1120, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1130 Application to existing buildings. Additions, alterations or repairs, changes of occupancy or use, and historic buildings that do not comply with the requirements for new buildings, shall comply with the requirements in Sections 1130 through 1134.

EXCEPTION: The building official may approve designs of alterations or repairs which do not fully conform with all of the requirements of Sections 1130 through 1134 where in the opinion of the building official full compliance is physically impossible and/or economically impractical and the alteration or repair improves the energy efficiency of the building.

In no case shall energy code requirements be less than those requirements in effect at the time of the initial construction of the building.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1130, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1131 Additions to existing buildings. Additions to existing buildings or structures may be constructed without making the entire building or structure comply, provided that the new additions shall conform to the provisions of this Code.

EXCEPTION: New additions which do not fully comply with the requirements of this Code and which have a floor area which is less than seven hundred fifty square feet may be approved provided that improvements are made to the existing building to compensate for any deficiencies in the new addition. Compliance shall be demonstrated by either systems analysis per Section 1141.4 or component performance calculations per Sections 1330 through 1334. The nonconforming addition and upgraded, existing building shall have an energy budget or target UA and SHGC that are less than or equal to the unimproved existing building, with the addition designed to comply with this Code.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1131, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1132 Alterations and repairs. Alterations and repairs to buildings or portions thereof originally constructed subject to the requirements of this Code shall conform to the provisions of this Code without the use of the exception in Section 1130. Other alterations and repairs may be made to existing buildings and moved buildings without making the entire building comply with all of the requirements of this Code for new buildings, provided the following requirements are met:

1132.1 Building Envelope: Alterations or repairs shall comply with nominal R-values and glazing requirements in Table 13-1 or 13-2.

EXCEPTIONS:

1. Storm windows installed over existing glazing.
2. Glass replaced in existing sash and frame provided that glazing is of equal or lower U-factor.
3. For solar heat gain coefficient compliance, glazing with a solar heat gain coefficient equal to or lower than that of the other existing glazing.
4. Existing roof/ceiling, wall or floor cavities exposed during construction provided that these cavities are insulated to full depth with insulation having a minimum nominal value of R-3.0 per inch installed per Sections 1311 and 1313.
5. Existing walls and floors without framing cavities, provided that any new cavities added to existing walls and floors comply with Exception 4.
6. Where the roof membrane is being replaced and
   a. The roof sheathing or roof insulation is not exposed; or
   b. If there is existing roof insulation below the deck.

In no case shall the energy efficiency of the building be decreased.

1132.2 Building Mechanical Systems: Those parts of systems which are altered or replaced shall comply with Chapter 14 of this Code.

1132.3 Lighting and Motors: Tenant improvements, alterations or repairs where 60 percent or more of the fixtures are new shall comply with Sections 1531 and 1532. Where less than 60 percent of the fixtures are new, the installed lighting wattage shall be maintained or reduced. Where 60 percent or more of the lighting fixtures in a suspended ceiling are new, and the existing insulation is on the suspended ceiling, the roof/ceiling assembly shall be insulated according to the provisions of Chapter 13 Section 1311.2.

Where new wiring is being installed to serve added fixtures and/or fixtures are being relocated to a new circuit, controls shall comply with Sections 1513.1 through 1513.5. Where a new lighting panel with all new raceway and conductor wiring from the panel to the fixtures is being installed, controls shall comply with Section 1513.6.

Those motors which are altered or replaced shall comply with Section 1511.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1132, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1133 Change of occupancy or use. Changes of occupancy or use shall comply with the following requirements:

a. Any unconditioned space that is altered to become conditioned space shall be required to be brought into full compliance with this Code.

b. Any Group R occupancy which is converted to other than a Group R occupancy shall be required to comply with all of the provisions of Sections 1130 through 1132 of this Code.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1133, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1134 Historic buildings. The building official may modify the specific requirements of this Code for historic buildings and require in lieu thereof alternate requirements which will result in a reasonable degree of energy efficiency. This modification may be allowed for those buildings which have been specifically designated as historically significant by the state or local governing body, or listed in The National Register of Historic Places or which have been determined to be eligible for listing.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1134, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1140 Enforcement. The building official shall have the power to render interpretations of this code and to adopt and enforce rules and supplemental regulations in order to clarify the application of its provisions. Such interpretations, rules and regulations shall be in conformance with the intent and purpose of this Code. Fees may be assessed for enforcement of this Code and shall be as set forth in the fee schedule adopted by the jurisdictions.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1140, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1141 Plans and specifications.

1141.1 General: If required by the building official, plans and specifications shall be submitted in support of an application for a building permit. If required by the building official, plans and specifications shall be stamped and authenticated by a registered design professional currently licensed in the state of Washington. All plans and specifications, together with supporting data, shall be submitted to the building official prior to issuance of a building permit.

1141.2 Details: The plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed including, but not limited to: Design criteria; exterior envelope component materials, U-factors of the envelope systems, R-values of insulating materials; U-factors and shading coefficients of glazing; area weighted U-factor calculations; efficiency, economizer, size and type of apparatus and equipment; fan system horsepower; equipment and systems controls; lighting fixture schedule with wattages and controls narrative; and other pertinent data to indicate compliance with the requirements of this Code.

1141.3 Alternate Materials and Method of Construction: The provisions of this Code are not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the building official as meeting the intent of this Code. The building official may approve any such alternate provided the proposed alternate meets or exceeds the provisions of this Code and that the material, method, design or work offered is for the purpose intended, at least the equivalent of that prescribed in this Code, in quality, strength, effectiveness, fire-resistance, durability, safety, and energy efficiency. The building official may require that sufficient evidence of proof be submitted to substantiate any claims that may be made regarding performance capabilities.

1141.4 Systems Analysis Approach for the Entire Building: In lieu of using Chapters 12 through 20, compliance may be demonstrated using the systems analysis option in RS-29. When using systems analysis, the proposed building shall provide equal or better conservation of energy than the standard design as defined in RS-29. If required by the building official, all energy comparison calculations submitted under the provisions of RS-29 shall be stamped and authenticated by an engineer or architect licensed to practice by the state of Washington.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1141, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1142 Materials and equipment.

1142.1 Identification: All materials and equipment shall be identified in order to show compliance with this Code.

1142.2 Maintenance Information: Maintenance instructions shall be furnished for any equipment which requires preventive maintenance for efficient operation. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1142, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1143 Inspections.

1143.1 General: All construction or work for which a permit is required shall be subject to inspection by the building official and all such construction or work shall remain accessible and exposed for inspection purposes until approved by the building official. No work shall be done on any part of the building or structure beyond the point indicated in each inspection without first obtaining the approval of the building official.

1143.2 Required Inspections: The building official, upon notification, shall make the inspection required in this Section, in addition to or as part of those inspections required in Section 108.5 of the Uniform Building Code. Inspections may be conducted by special inspection pursuant to Section 1701 of the Uniform Building Code. Where applicable, inspections shall include at least:

1143.2.1 Envelope

a. Wall Insulation Inspection: To be made after all wall insulation and air vapor retarder sheet or film materials are in place, but before any wall covering is placed.

b. Glazing Inspection: To be made after glazing materials are installed in the building.

c. Exterior Roofing Insulation: To be made after the installation of the roof insulation, but before concealment.

d. Slab/Floor Insulation: To be made after the installation of the slab/floor insulation, but before concealment.

1143.2.2 Mechanical

a. Mechanical Equipment Efficiency and Economizer: To be made after all equipment and controls required by this Code are installed and prior to the concealment of such equipment or controls.

b. Mechanical Pipe and Duct Insulation: To be made after all pipe and duct insulation is in place, but before concealment.

1143.2.3 Lighting and Motors

a. Lighting Equipment and Controls: To be made after the installation of all lighting equipment and controls required by this Code, but before concealment of the lighting equipment.

b. Motor Inspections: To be made after installation of all equipment covered by this Code, but before concealment.

1143.3 Re-inspection: The building official may require a structure to be re-inspected. A re-inspection fee may be assessed for each inspection or re-inspection when such portion of work for which inspection is called is not complete or when corrections called for are not made.

[Statutory Authority: Chapters 19.27 and 19.27A RCW and 1994 c 226. 95-01-126, § 51-11-1143, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1143, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1144 Violations. It shall be a violation of this Code for any person, firm, or corporation to erect or construct any building, or remodel or rehabilitate any existing building or structure in the state, or allow the same to be done, contrary to any of the provisions of this Code.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1144, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1150 Conflicts with other codes. In case of conflicts among Codes enumerated in RCW 19.27.031 (1), (2), (3) and (4) and this Code, the first named Code shall govern. The duct insulation requirements in this Code or a local jurisdiction's energy code, whichever is more stringent, supersede the requirements in the Uniform Mechanical Code.

Where, in any specific case, different sections of this Code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1150, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1160 Severability and liability.

1161 Severability: If any provision of this Code or its application to any person or circumstance is held invalid, the remainder of this Code or the application of the provision to other persons or circumstances is not affected.

1162 Liability: Nothing contained in this Code is intended to be nor shall be construed to create or form the basis for any liability on the part of any city or county or its officers, employees or agents for any injury or damage resulting from the failure of a building to conform to the provisions of this Code.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1160, filed 10/18/93, effective 4/1/94.]

CHAPTER 12
DEFINITIONS

WAC 51-11-1201 Scope. The following definitions will apply to Chapters 11 through 20.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1201, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1210 Application of terms. For the purposes of this Code, certain abbreviations, terms, phrases, words and their derivatives, shall be as set forth in this chapter. Where terms are not defined, they shall have their ordinary accepted meanings within the context with which they are used. In the event there is a question about the definition of a term, the definitions for terms in the Codes enumerated in RCW 19.27.031 and the edition of Webster's dictionary referenced therein shall be considered as the sources for providing ordinarily accepted meanings.

AAMA: American Architectural Manufacturers Association.

ADDITION: See the Washington State Building Code.

ADVANCED FRAMED CEILING: Advanced framing assumes full and even depth of insulation extending to the outside edge of exterior walls. (See **Standard Framing** and Section 2007.2 of this Code.)

ADVANCED FRAMED WALLS: Studs framed on twenty-four inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and one stud is used to support each header. Headers consist of double 2X material with R-10 insulation between the header and exterior sheathing. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall. (See **Standard Framing** and Section 2005.2 of this Code.)

AFUE - ANNUAL FUEL UTILIZATION EFFICIENCY: Unlike steady state conditions, this rating is based on average usage including on and off cycling as set out in the standardized Department of Energy Test Procedures.

AIR CONDITIONING, COMFORT: The process of treating air to control simultaneously its temperature, humidity, cleanliness and distribution to meet requirements of the conditioned space.

ARI: Air Conditioning and Refrigeration Institute.

ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

ASTM: American Society for Testing and Materials.

AUTOMATIC: Self-acting, operating by its own mechanism when actuated by some impersonal influence, as for example, a change in current strength, pressure, temperature or mechanical configuration. (See **Manual**.)

BELOW GRADE WALLS: Walls or the portion of walls which are entirely below the finished grade or which extend two feet or less above the finish grade.

BOILER CAPACITY: The rate of heat output in Btu/h measured at the boiler outlet, at the design inlet and outlet conditions and rated fuel/energy input.

BUILDING ENVELOPE: The elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior, or to or from unconditioned spaces, or to or from semi-heated spaces, or to or from spaces exempted by the provisions of Section 1301.

BUILDING, EXISTING: See the Washington State Building Code.

BUILDING OFFICIAL: The official authorized to act in behalf of a jurisdiction code enforcement agency or its authorized representative.

BUILDING PROJECT: A building or group of buildings, including on-site energy conversion or electric-generating facilities, which utilize a single submittal for a construction permit or are within the boundary of a contiguous area under one ownership.

CONDITIONED FLOOR AREA: (See **Gross Conditioned Floor Area.**)

CONDITIONED SPACE: A cooled space, heated space (fully heated), heated space (semi-heated), or indirectly conditioned space.

COOLED SPACE: An enclosed space within a building that is cooled by a cooling system whose sensible capacity

a. exceeds 5 Btu/(h●ft²), or
b. is capable of maintaining space dry bulb temperature of 90 degrees F or less at design cooling conditions.

COP - COEFFICIENT OF PERFORMANCE: The ratio of the rate of net heat output (heating mode) or heat removal (cooling mode) to the rate of total on-site energy input to the heat pump, expressed in consistent units and under designated rating conditions. (See **Net Heat Output, Net Heat Removal, Total On-Site Energy Input.**)

DAYLIGHTED ZONE:

a. Under overhead glazing: The area under overhead glazing whose horizontal dimension, in each direction, is equal to the overhead glazing dimension in that direction plus either the floor to ceiling height or the dimension to a ceiling height opaque partition, or one-half the distance to adjacent overhead or vertical glazing, whichever is least.
b. At vertical glazing: The area adjacent to vertical glazing which receives daylighting from the glazing. For purposes of this definition and unless more detailed daylighting analysis is provided, the daylighting zone depth is assumed to extend into the space a distance of 15 feet or to the nearest ceiling height opaque partition, whichever is less. The daylighting zone width is assumed to be the width of the window plus either two feet on each side (the distance to an opaque partition) or one-half the distance to adjacent overhead or vertical glazing, whichever is least.

DAYLIGHT SENSING CONTROL (DS): A device that automatically regulates the power input to electric lighting near the glazing to maintain the desired workplace illumination, thus taking advantage of direct or indirect sunlight.

DEADBAND: The temperature range in which no heating or cooling is used.

DESIGN COOLING CONDITIONS: The cooling outdoor design temperature from the 0.5 percent column for summer from the Puget Sound Chapter of ASHRAE publication "Recommended Outdoor Design Temperatures, Washington State, ASHRAE."

DESIGN HEATING CONDITIONS: The heating outdoor design temperature from the 0.6 percent column for winter from the Puget Sound Chapter of ASHRAE publication "Recommended Outdoor Design Temperatures, Washington State, ASHRAE."

DOOR AREA: Total area of door measured using the rough opening and including the door and frame.

DOOR: All operable opening areas, which are not glazing, in the building envelope including swinging and roll-up doors, fire doors, smoke vents and access hatches.

DWELLING UNIT: See the Washington State Building Code.

EER - ENERGY EFFICIENCY RATIO: The ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions.

ECONOMIZER, AIR: A ducting arrangement and automatic control system that allows a cooling supply fan system to supply outside air to reduce or eliminate the need for mechanical refrigeration during mild or cold weather.

ECONOMIZER, WATER: A system by which the supply air of a cooling system is cooled directly, indirectly, or both, by evaporation of water or by other appropriate fluid in order to reduce or eliminate the need for mechanical refrigeration.

EFFICIENCY, HVAC SYSTEM: The ratio of useful energy (at the point of use) to the energy input for a designated time period, expressed in percent.

EMISSIVITY: The ability to absorb infrared radiation. A low emissivity implies a higher reflectance of infrared radiation.

ENERGY: The capacity for doing work; taking a number of forms which may be transformed from one into another, such as thermal (heat), mechanical (work), electrical and chemical; in customary units, measured in kilowatt-hours (Kwh) or British thermal units (Btu). (See **New energy**.)

ENERGY, RECOVERED: (See **Recovered energy**.)

EXTERIOR ENVELOPE: (See **Building envelope**.)

FACADE AREA: Vertical projected area including nonhorizontal roof area, overhangs, cornices, etc. measured in elevation in a vertical plane parallel to the plane of the building face.

FLOOR OVER UNCONDITIONED SPACE: A floor which separates a conditioned space from an unconditioned space which is buffered from exterior ambient conditions including vented crawl spaces and unconditioned basements or other similar spaces, or exposed to exterior ambient conditions including open parking garages and enclosed garages which are mechanically ventilated.

F-FACTOR: The perimeter heat loss factor expressed in Btu/h●ft °F.

F-VALUE: (See **F-Factor**.)

GLAZING: All areas, including the frames, in the shell of a conditioned space that let in natural light including windows, clerestories, skylights, sliding or swinging glass doors and glass block walls.

GLAZING AREA: Total area of the glazing measured using the rough opening, and including the glazing, sash, and

frame. For doors where the daylight opening area is less than fifty percent of the door area, the glazing area is the daylight opening area. For all other doors, the glazing area is the door area.

GROSS CONDITIONED FLOOR AREA: The horizontal projection of that portion of interior space which is contained within exterior walls and which is conditioned directly or indirectly by an energy-using system, and which has an average height of five feet or greater, measured from the exterior faces.

GROSS EXTERIOR WALL AREA: The normal projection of the building envelope wall area bounding interior space which is conditioned by an energy-using system; includes opaque wall, vertical glazing and door areas. The gross area of walls consists of all opaque wall areas, including foundation walls, between floor spandrels, peripheral edges of floors, vertical glazing areas, and door areas, where such surfaces are exposed to exterior ambient conditions and enclose a conditioned space including interstitial areas between two such spaces. (See **Below Grade Wall.**)

GROSS FLOOR AREA: The sum of the areas of the several floors of the building, including basements, cellars, mezzanine and intermediate floored tiers and penthouses of headroom height, measured from the exterior faces of exterior walls or from the center line of walls separating buildings, but excluding: Covered walkways, open roofed-over areas, porches and similar spaces, pipe trenches, exterior terraces or steps, chimneys, roof overhangs and similar features.

GROSS ROOF/CEILING AREA: A roof/ceiling assembly shall be considered as all components of the roof/ceiling envelope through which heat flows, thus creating a building transmission heat loss or gain, where such assembly is exposed to exterior ambient conditions and encloses a conditioned space. The assembly does not include those components that are separated from a heated and/or cooled space by a vented airspace. The gross area of a roof/ceiling assembly consists of the total interior surface of such assembly, including overhead glazing.

GUEST ROOM: See the Washington State Building Code.

HEAT: The form of energy that is transferred by virtue of a temperature difference.

HEAT STORAGE CAPACITY: The physical property of materials (mass) located inside the building envelope to absorb, store, and release heat.

HEATED SPACE (FULLY HEATED): An enclosed space within a building, including adjacent connected spaces separated by an un-insulated component (e.g., basements, utility rooms, garages, corridors), which is heated by a heating system whose output capacity is

a. capable of maintaining a space dry-bulb temperature of 45 degrees F or greater at design heating conditions; or
b. 8 Btu/(h●ft²) or greater in Climate Zone 1 and 12 Btu/(h● ft²) or greater in Climate Zone 2.

HEATED SPACE (SEMI-HEATED): An enclosed space within a building, including adjacent connected spaces separated by an un-insulated component (e.g., basements, utility rooms, garages, corridors), which is heated by a heating system

a. whose output capacity is 3 Btu/(h●ft²) or greater in Climate Zone 1 and 5 Btu/(h●ft²) or greater in Climate Zone 2; and
b. is not a Heated Space (Fully Heated).

HSPF - HEATING SEASON PERFORMANCE FACTOR: The total heating output (in Btu) of a heat pump during its normal annual usage period for heating divided by the total (watt hour) electric power input during the same period, as determined by test procedures consistent with the U.S. Department of Energy "Test Procedure for Central Air Conditioners, Including Heat Pumps" published in RS-30. When specified in Btu per watt hour an HSPF of 6.826 is equivalent to a COP of 2.0.

HUMIDISTAT: A regulatory device, actuated by changes in humidity, used for automatic control of relative humidity.

HVAC: Heating, ventilating and air conditioning.

HVAC SYSTEM COMPONENTS: HVAC system components provide, in one or more factory-assembled packages, means for chilling and/or heating water with controlled temperature for delivery to terminal units serving the conditioned spaces of the buildings. Types of HVAC system components include, but are not limited to, water chiller packages, reciprocating condensing units and water source (hydronic) heat pumps. (See **HVAC system equipment.**)

HVAC SYSTEM EFFICIENCY: (See **Efficiency, HVAC system.**)

HVAC SYSTEM EQUIPMENT: HVAC system equipment provides, in one (single package) or more (split system) factory-assembled packages, means for air circulation, air cleaning, air cooling with controlled temperature and dehumidification; and optionally, either alone or in combination with a heating plant, the functions of heating and humidifying. The cooling function may be either electrically or heat operated and the refrigerant condenser may be air, water or evaporatively cooled. Where the equipment is provided in more than one package, the separate packages shall be designed by the manufacturer to be used together. The equipment may provide the heating function as a heat pump or by the use of electric elements. (The word "equipment" used without modifying adjective may, in accordance with common industry usage, apply either to HVAC system equipment or HVAC system components.)

INDIRECTLY CONDITIONED SPACE: An enclosed space within a building that is not a heated or cooled space, whose area weighted heat transfer coefficient to heated or cooled spaces exceeds that to the outdoors or to unconditioned spaces; or through which air from heated or cooled spaces is transferred at a rate exceeding three air changes per hour. Enclosed corridors between conditioned spaces shall be considered as indirectly conditioned space. (See **Heated Space, Cooled Space** and **Unconditioned Space.**)

INFILTRATION: The uncontrolled inward air leakage through cracks and interstices in any building element and around windows and doors of a building caused by the

pressure effects of wind and/or the effect of differences in the indoor and outdoor air density.

INSULATION BAFFLE: A rigid material, resistant to wind driven moisture, the purpose of which is to allow air to flow freely into the attic or crawl space and to prevent insulation from blocking the ventilation of these spaces, or the loss of insulation. Example materials for this purpose are sheet metal, or wax impregnated cardboard.

INSULATION POSITION:

a. **Exterior Insulation Position:** A wall having all or nearly all of its mass exposed to the room air with the insulation on the exterior of the mass.
b. **Integral Insulation Position:** A wall having mass exposed to both room and outside air, with substantially equal amounts of mass on the inside and outside of the insulation layer.
c. **Interior Insulation Position:** A wall not meeting either of the above definitions; particularly a wall having most of its mass external to the insulation layer.

IPLV - INTEGRATED PART-LOAD VALUE: A single number figure of merit based on part-load EER or COP expressing part-load efficiency for air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities for the equipment as specified in the Air Conditioning and Refrigeration Institute (ARI) and Cooling Tower Institute (CTI) procedures.

LUMINAIRE: A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the electric power supply.

MANUAL: Capable of being operated by personal intervention.
(See **Automatic**.)

NFPA: National Fire Protection Association.

NFRC: National Fenestration Rating Council.

NET HEAT OUTPUT: The change in the total heat content of the air entering and leaving the equipment (not including supplementary heat and heat from boilers).

NET HEAT REMOVAL: The total difference in heat content of the air entering and leaving the equipment (without heat) or the difference in total heat content of the water or refrigerant entering and leaving the component.

NEW ENERGY: Energy, other than recovered energy, utilized for the purpose of heating or cooling. (See **Energy**.)

NOMINAL R-VALUE: The thermal resistance of insulation as specified by the manufacturer according to recognized trade and engineering standards.

NONRENEWABLE ENERGY SOURCES: All energy sources that are not renewable energy sources including natural gas, oil, coal, wood, liquified petroleum gas, steam, and any utility-supplied electricity.

NONRESIDENTIAL: All buildings and spaces in the Uniform Building Code (UBC) occupancies other than Group R.

OCCUPANCY: See the Washington State Uniform Building Code.

OCCUPANCY SENSOR: A device that detects occupants within an area, causing any combination of lighting, equipment or appliances to be turned on or shut off.

OPAQUE ENVELOPE AREAS: All exposed areas of a building envelope which enclose conditioned space, except openings for doors, glazing and building service systems.

OPEN BLOWN: Loose fill insulation pneumatically installed in an unconfined attic space.

OUTDOOR AIR (OUTSIDE AIR): Air taken from the outdoors and, therefore, not previously circulated through a building.

OVERHEAD GLAZING: A glazing surface that has a slope of less than sixty degrees from the horizontal plane.

PACKAGED TERMINAL AIR CONDITIONER: A factory-selected combination of heating and cooling components, assemblies or sections intended to serve a room or zone. (For the complete technical definition, see Standard RS-10.)

PERMEANCE (PERM): The ability of a material of specified thickness to transmit moisture in terms of amount of moisture transmitted per unit time for a specified area and differential pressure (grains per hour●ft²●inches of HG). Permeance may be measured using ASTM E-96-72 or other approved dry cup method as specified in RS-1.

POOL COVER: A vapor-retardant cover which lies on or at the surface of the pool.

POWER: In connection with machines, the time rate of doing work. In connection with the transmission of energy of all types, the rate at which energy is transmitted; in customary units, it is measured in watts (W) or British Thermal Units per hour (Btu/h).

PROCESS ENERGY: Energy consumed in support of a manufacturing, industrial, or commercial process other than the maintenance of building comfort or amenities for building occupants.

RADIANT FLOOR: A floor assembly, on grade or below, containing heated pipes, ducts, or electric heating cables that constitute a floor or portion thereof for complete or partial heating of the structure.

READILY ACCESSIBLE: See the Washington State Mechanical Code.

RECOOLING: The removal of heat by sensible cooling of the supply air (directly or indirectly) that has been previously heated above the temperature to which the air is to be supplied to the conditioned space for proper control of the temperature of that space.

RECOVERED ENERGY: Energy utilized which would otherwise be wasted (i.e., not contribute to a desired end use) from an energy utilization system.

REHEAT: The application of sensible heat to supply air that has been previously cooled below the temperature of the conditioned space by either mechanical refrigeration or the introduction of outdoor air to provide cooling.

RENEWABLE ENERGY SOURCES: Renewable energy sources (excluding minerals) derived from: (1) incoming solar radiation, including but not limited to, natural daylighting and photosynthetic processes; (2) energy sources resulting from wind, waves and tides, lake or pond thermal differences; and (3) energy derived from the internal heat of the earth, including nocturnal thermal exchanges.

RESET: Adjustment of the set point of a control instrument to a higher or lower value automatically or manually to conserve energy.

ROOF/CEILING ASSEMBLY: (See **Gross Roof/Ceiling Area.**)

SEER - SEASONAL ENERGY EFFICIENCY RATIO: The total cooling output of an air conditioner during its normal annual usage period, in Btu's, divided by the total electric energy input in watt-hours, during the same period, as determined by 10 CFR, Part 430.

SEMI-HEATED SPACE: Sub-category of **Heated Space.** (See **Heated Space.**)

SEQUENCE: A consecutive series of operations.

SERVICE SYSTEMS: All energy-using systems in a building that are operated to provide services for the occupants or processes housed therein, including HVAC, service water heating, illumination, transportation, cooking or food preparation, laundering or similar functions.

SERVICE WATER HEATING: Supply of hot water for domestic or commercial purposes other than comfort heating.

SHADED: Glazed area which is externally protected from direct solar radiation by use of devices permanently affixed to the structure or by an adjacent building, topographical feature, or vegetation.

SHADING COEFFICIENT: The ratio of solar heat gain occurring through non-opaque portions of the glazing, with or without integral shading devices, to the solar heat gain occurring through an equivalent area of unshaded, 1/8-inch thick, clear, double-strength glass.

Note: Heat gains to be compared under the same conditions. See Chapter 26 of Standard RS-27, listed in Chapter 17 of this Code.

SHALL: Denotes a mandatory Code requirement.

SKYLIGHT: (See **Overhead Glazing.**)

SLAB-BELOW-GRADE: Any portion of a slab floor in contact with the ground which is more than twenty-four inches below the final elevation of the nearest exterior grade.

SLAB-ON-GRADE, EXTERIOR: Any portion of a slab floor in contact with the ground which is less than or equal to twenty-four inches below the final elevation of the nearest exterior grade.

SOLAR ENERGY SOURCE: Source of natural daylighting and of thermal, chemical or electrical energy derived directly from conversion of incident solar radiation.

SOLAR HEAT GAIN COEFFICIENT (SHGC): The ratio of the solar heat gain entering the space through the glazing product to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation which is then reradiated, conducted, or convected into the space.

SPLIT SYSTEM: Any heat pump or air conditioning unit which is provided in more than one assembly requiring refrigeration piping installed in the field.

STANDARD FRAMING: All framing practices not defined as "intermediate" or "advanced" shall be considered standard. (See **Advanced framed ceiling, Advanced framed walls, Intermediate framed wall.**)

SUBSTANTIAL CONTACT: A condition where adjacent building materials are placed in a manner that proximal surfaces are contiguous, being installed and supported as to eliminate voids between materials, without compressing or degrading the thermal performance of either product.

SYSTEM: A combination of central or terminal equipment or components and/or controls, accessories, interconnecting means, and terminal devices by which energy is transformed so as to perform a specific function, such as HVAC, service water heating or illumination.

TAPERING: Installation of a reduced level of ceiling insulation at the eaves, due to reduced clearance.

THERMAL BY-PASS: An area where the envelope surrounding the conditioned space is breached, or where an ineffective application compromises the performance of a thermal or infiltration barrier, increasing the structure's energy consumption by exposing finished surfaces to ambient conditions and additional heat transfer.

THERMAL CONDUCTANCE (C): Time rate of heat flow through a body (frequently per unit area) from one of its bounding surfaces to the other for a unit temperature difference between the two surfaces, under steady conditions (Btu/h●ft²●°F).

THERMAL RESISTANCE (R): The reciprocal of thermal conductance (h●ft²●°F/Btu).

THERMAL TRANSMITTANCE (U): The coefficient of heat transmission (air to air). It is the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h●ft²●°F).

THERMAL TRANSMITTANCE, OVERALL (U_o): The overall (average) heat transmission of a gross area of the exterior building envelope (Btu/h●ft²●°F). The U_o-factor applies to the combined effect of the time rate of heat flows through the various parallel paths, such as glazing, doors and opaque construction areas, comprising the gross area of one or more exterior building components, such as walls, floors or roof/ceiling.

THERMOSTAT: An automatic control device actuated by temperature and designed to be responsive to temperature.

TOTAL ON-SITE ENERGY INPUT: The combination of all the energy inputs to all elements and accessories as included in the equipment components, including but not limited to, compressor(s), compressor sump heater(s), circulating pump(s), purge devices, fan(s), and the HVAC system component control circuit.

TRANSMISSION COEFFICIENT: The ratio of the solar heat gain through a glazing system to that of an unshaded single pane of double strength window glass under the same set of conditions.

U-FACTOR: (See **Thermal Transmittance.**)

U-VALUE: (See **U-Factor.**)

UNCONDITIONED SPACE: Space within a building that is not a conditioned space. (See **Conditioned Space**).

UNIFORM BUILDING CODE: The Washington State Uniform Building Code as modified by the Washington State Building Code Council.

UNIFORM MECHANICAL CODE: The Washington State Uniform Mechanical Code as modified by the Washington State Building Code Council.

UNIFORM PLUMBING CODE (UPC): The Washington State Uniform Plumbing Code as modified by the Washington State Building Code Council.

UNITARY COOLING AND HEATING EQUIPMENT: One or more factory-made assemblies which include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well. Where such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

UNITARY HEAT PUMP: One or more factory-made assemblies which include an indoor conditioning coil, compressor(s) and outdoor coil or refrigerant-to-water heat exchanger, including means to provide both heating and cooling functions. When such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

VAPOR RETARDER: A layer of low moisture transmissivity material (not more than 1.0 perm dry cup) placed over the warm side (in winter) of insulation, over the exterior of below grade walls, and under floors as ground cover to limit the transport of water and water vapor through exterior walls, ceilings, and floors. Vapor retarding paint, listed for this application, also meets this definition.

VAULTED CEILINGS: All ceilings where enclosed joist or rafter space is formed by ceilings applied directly to the underside of roof joists or rafters.

VENTILATION: The process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned.

VENTILATION AIR: That portion of supply air which comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

VERTICAL GLAZING: A glazing surface that has a slope of sixty degrees or greater from the horizontal plane.

WALLS (EXTERIOR): Any member or group of members which defines the exterior boundaries or courts of a building and which have a slope of sixty degrees or greater with the horizontal plane, and separates conditioned from unconditioned space. Band joists between floors are to be considered a part of exterior walls.

ZONE: A space or group of spaces within a building with heating and/or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device. Each dwelling unit in residential buildings shall be considered a single zone.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1210, filed 10/18/93, effective 4/1/94.]

CHAPTER 13
BUILDING ENVELOPE

WAC 51-11-1301 Scope. Conditioned buildings or portions thereof shall be constructed to provide the required thermal performance of the various components according to the requirements of this chapter. Unless otherwise approved by the building official, all spaces shall be assumed to be at least semi-heated.

EXCEPTION:
1. Greenhouses isolated from any conditioned space and not intended for occupancy.
2. As approved by the building official, spaces not assumed to be at least semi-heated.
3. Unconditioned Group M occupancy accessory to Group R occupancy.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1301, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1302 Space heat type. For the purpose of determining building envelope requirements, the following two categories comprise all space heating types:

Electric Resistance: Space heating systems which use electric resistance elements as the primary heating systems including baseboard, radiant, and forced air units where the total electric resistance heat capacity exceeds one watt per square foot of the gross conditioned floor area.

EXCEPTION: Heat pumps and terminal electric resistance heating in variable air volume distribution systems.

Other: All other space heating systems including gas, solid fuel, oil, and propane space heating systems and those systems listed in the exception to electric resistance.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1302, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1303 Climate zones. All buildings shall comply with the requirements of the appropriate climate zone as defined herein.

ZONE 1: Climate Zone 1 shall include all counties not included in Climate Zone 2.

ZONE 2: Climate Zone 2 shall include: Adams, Chelan, Douglas, Ferry, Grant, Kittitas, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, and Whitman counties.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1303, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1310 General requirements. The building envelope shall comply with Sections 1311 through 1314.

1310.1 Conditioned Spaces: The building envelope for conditioned spaces shall also comply with one of the following paths:

a. Prescriptive Building Envelope Option Sections 1320 through 1323.

b. Component Performance Building Envelope Option Sections 1330 through 1334.

c. Systems Analysis. See Section 1141.4.

1310.2 Semi-Heated Spaces: All spaces shall be considered conditioned spaces, and shall comply with the requirements in Section 1310.1 unless they meet the following criteria for semi-heated spaces. The installed heating equipment output, in Climate Zone 1, shall be 3 Btu/(h●ft²) or greater but not greater than 8 Btu/(h●ft²) and in Climate Zone 2, shall be 5 Btu/(h●ft²) or greater but not greater than 12 Btu/(h●ft²). Heating shall be controlled by a thermostat mounted not lower than the heating unit and capable of preventing heating above 44 degrees space temperature. For semi-heated spaces, the only prescriptive, component performance, or systems analysis building envelope requirement shall be that:

Climate Zone 1

a. U=0.10 maximum for the roof assembly, or
b. continuous R-9 insulation installed entirely outside of the roof structure, or
c. R-11 insulation installed inside or within a wood roof structure, or
d. R-19 insulation installed inside or within a metal roof structure.

Climate Zone 2

a. U=0.07 maximum for the roof assembly, or
b. continuous R-14 insulation installed entirely outside of the roof structure, or
c. R-19 insulation installed inside or within a wood roof structure, or
d. R-25 insulation installed inside or within a metal roof structure.

Figure 13A
Building Envelope Compliance Options

Section Number	Subject	Prescriptive Option	Component Performance Option	Systems Analysis Option
1310	General Requirements	X	X	X
1311	Insulation	X	X	X
1312	Glazing and Doors	X	X	X
1313	Moisture Control	X	X	X
1314	Air Leakage	X	X	X
1320	Prescriptive Building Envelope Option	X		
1321	General	X		
1322	Opaque Envelope	X		
1323	Glazing	X		
1330	Component Performance Building Envelope Option		X	
1331	General		X	
1332	Component U-Factors		X	
1333	UA Calculations		X	
1334	Solar Heat Gain Coefficient		X	
RS-29	Systems Analysis			X

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1310, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1311 Insulation.

1311.1 Installation Requirements: All insulation materials shall be installed according to the manufacturer's instructions to achieve proper densities, maintain clearances, and maintain uniform R-values. To the maximum extent possible, insulation shall extend over the full component area to the intended R-value.

1311.2 Roof/Ceiling Insulation: Open-blown or poured loose-fill insulation may be used in attic spaces where the slope of the ceiling is not more than three feet in twelve and there is at least thirty inches of clear distance from the top of the bottom chord of the truss or ceiling joist to the underside of the sheathing at the roof ridge. When eave vents are installed, baffling of the vent openings shall be provided so as to deflect the incoming air above the surface of the insulation.

Where lighting fixtures are recessed into a suspended or exposed grid ceiling, the roof/ceiling assembly shall be insulated in a location other than directly on the suspended ceiling.

EXCEPTION: Type IC rated recessed lighting fixtures.

Where installed in wood framing, faced batt insulation shall be face stapled.

1311.3 Wall Insulation: Exterior wall cavities isolated during framing shall be fully insulated to the levels of the surrounding walls. When installed in wood framing, faced batt insulation shall be face stapled.

Above grade exterior insulation shall be protected.

1311.4 Floor Insulation: Floor insulation shall be installed in a permanent manner in substantial contact with the surface being insulated. Insulation supports shall be installed so spacing is not more than twenty-four inches on center. Installed insulation shall not block the airflow through foundation vents.

1311.5 Slab-On-Grade Floor: Slab-on-grade insulation installed inside the foundation wall shall extend downward from the top of the slab a minimum distance of twenty-four inches or to the top of the footing, whichever is less. Insulation installed outside the foundation shall extend downward a minimum of twenty-four inches or to the frostline, whichever is greater. Above grade insulation shall be protected.

EXCEPTION: For monolithic slabs, the insulation shall extend downward from the top of the slab to the bottom of the footing.

1311.6 Radiant Floors (on or below grade): Slab-on-grade insulation shall extend downward from the top of the slab a minimum distance of thirty-six inches or downward to the top of the footing and horizontal for an aggregate of not less than thirty-six inches.

If required by the building official where soil conditions warrant such insulation, the entire area of a radiant floor shall be thermally isolated from the soil. Where a soil gas control system is provided below the radiant floor, which results in increased convective flow below the radiant floor, the radiant floor shall be thermally isolated from the subfloor gravel layer.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1311, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1312 Glazing and doors.

1312.1 Standard Procedure for Determination of Glazing and Door U-Factors: U-Factors for glazing and doors shall be determined, certified and labeled in accordance with RS-31 by a certified independent agency licensed by the National Fenestration Rating Council (NFRC). Compliance shall be based on Model Size AA or BB. Product samples used for U-factor determinations shall be production line units or representative of units as purchased by the consumer or contractor. Unlabeled glazing and doors shall be assigned the default U-factor in Section 2006.

1312.2 Solar Heat Gain Coefficient and Shading Coefficient: Solar Heat Gain Coefficient (SHGC), shall be determined, certified and labelled in accordance with the National Fenestration Rating Council (NFRC) Standard by a certified, independent agency, licensed by the NFRC.

EXCEPTION: Shading coefficients (SC) shall be an acceptable alternate for compliance with solar heat gain coefficient requirements. Shading coefficients for glazing shall be taken from Chapter 27 of RS-27 or from the manufacturer's test data.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1312, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1313 Moisture control.

1313.1 Vapor Retarders: Vapor retarders shall be installed on the warm side (in winter) of insulation as required by this section.

EXCEPTION: Vapor retarder installed with not more than 1/3 of the nominal R-value between it and the conditioned space.

1313.2 Roof/Ceiling Assemblies: Roof/ceiling assemblies where the ventilation space above the insulation is less than an average of twelve inches shall be provided with a vapor retarder. Roof/ceiling assemblies without a vented airspace, where neither the roof deck nor the roof structure are made of wood, shall provide a continuous vapor retarder with taped seams.

EXCEPTION: Vapor retarders need not be provided where all of the insulation is installed between the roof membrane and the structural roof deck.

1313.3 Walls: Walls separating conditioned space from unconditioned space shall be provided with a vapor retarder.

1313.4 Floors: Floors separating conditioned space from unconditioned space shall be provided with a vapor retarder.

1313.5 Crawl Spaces: A ground cover of six mil (0.006 inch thick) black polyethylene or approved equal shall be laid over the ground within crawl spaces. The ground cover shall be overlapped twelve inches minimum at the joints and shall extend to the foundation wall.

EXCEPTION: The ground cover may be omitted in crawl spaces if the crawl space has a concrete slab floor with a minimum thickness of three and one-half inches.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1313, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1314 Air leakage.

1314.1 Building Envelope: The requirements of this section shall apply to building elements separating conditioned from unconditioned spaces. Exterior joints around windows and door frames, openings between walls and foundation, between walls and roof and wall panels; openings at penetrations of utility services through walls, floors, and roofs; and all other openings in the building envelope shall be sealed, caulked, gasketed, or weatherstripped to limit air leakage.

1314.2 Glazing and Doors: Doors and operable glazing separating conditioned from unconditioned space shall be weatherstripped. Fixed windows shall be tight fitting with glass retained by stops with sealant or caulking all around.

EXCEPTION: Openings that are required to be fire resistant.

1314.3 Building Assemblies Used as Ducts or Plenums: Building assemblies used as ducts or plenums shall be sealed, caulked, and gasketed to limit air leakage.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1314, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1320 Prescriptive building envelope option.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1320, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1321 General. This section establishes building envelope design criteria in terms of prescribed requirements for building construction.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1321, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1322 Opaque envelope. Roof/ceilings, opaque exterior walls, opaque doors, floors over unconditioned space, below grade walls, slab on grade floors, and radiant floors enclosing conditioned spaces shall be insulated according to Section 1311 and Tables 13-1 or 13-2. Compliance with nominal R-values shall be demonstrated for the thermal resistance of the added insulation in framing cavities and/or insulated sheathing only. Nominal R-values shall not include the thermal transmittance of other building materials or air films.

EXCEPTIONS:

1. Opaque smoke vents are not required to meet insulation requirements.
2. The perimeter edge of an above grade floor slab which penetrates the exterior wall may be left uninsulated provided that the wall insulation is increased by R-2 above that required in Tables 13-1 and 13-2.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1322, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1323 Glazing. Glazing shall comply with Section 1312 and Tables 13-1 or 13-2. All glazing shall be, at a minimum, double glazing.

EXCEPTIONS:

1. Vertical glazing located on the street level story of a retail occupancy provided the glazing is double-glazed with a minimum 1/2 inch airspace and does not exceed 75 percent of the gross exterior wall area of the street level story which does not exceed 20 feet in height. When this exception is utilized, separate calculations shall be performed for these sections of the building envelope and these values shall not be averaged with any others for compliance purposes. The

75 percent area may be exceeded on the street level, if the additional glass area is provided from allowances from other areas of the building.

2. Single glazing for ornamental, security, or architectural purposes shall be included in the percentage of the total glazing area, U-factor calculation and SHGC as allowed in the Tables 13-1 or 13-2. The maximum area allowed for the total of all single glazing is one percent of the gross exterior wall floor area.

1323.1 Area: The percentage of total glazing (vertical and overhead) area relative to the gross exterior wall area shall not be greater than the appropriate value from Tables 13-1 or 13-2 for the vertical glazing U-factor, overhead glazing U-factor and solar heat gain coefficient selected.

1323.2 U-Factor: The area-weighted average U-factor of vertical glazing shall not be greater than that specified in Tables 13-1 or 13-2 for the appropriate area and solar heat gain coefficient. The area-weighted average U-factor of overhead glazing shall not be greater than that specified in Tables 13-1 or 13-2 for the appropriate area and solar heat gain coefficient. U-factors for glazing shall be determined in accordance with Section 1312.

1323.3 Solar Heat Gain Coefficient: The area-weighted average solar heat gain coefficient of vertical glazing shall not be greater than that specified in Tables 13-1 or 13-2 for the appropriate area and U-factor. The area-weighted average solar heat gain coefficient of overhead glazing shall not be greater than that specified in Tables 13-1 or 13-2 for the appropriate area and U-factor.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1323, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1330 Component performance building envelope option.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1330, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1331 General. Buildings or structures whose design heat loss rate (UA_p) and solar heat gain coefficient ($SHGC_p$) are less than or equal to the target heat loss rate (UA_t) and solar heat gain coefficient ($SHGC_t$) shall be considered in compliance with this section. The stated U-factor, F-factor or allowable area of any component assembly, listed in Tables 13-1 or 13-2, such as roof/ceiling, opaque wall, opaque door, glazing, floor over conditioned space, slab on grade floor, radiant floor or opaque floor may be increased and the U-factor or F-factor for other components decreased, provided that the total heat gain or loss for the entire building envelope does not exceed the total resulting from compliance to the U-factors, F-factors or allowable areas specified in this section.

EXCEPTION: For buildings or structures utilizing the other space heat type (including heat pumps and VAV) compliance path, for the gross opaque wall, opaque door and glazing (vertical and overhead) area only, compliance may also be shown using the ENVSTD diskette version 2.1 or later of RS-9 with the following additional requirements:

1. Only the Exterior Wall Requirements portion of RS-32 may be used under this exception.
2. Overhead glazing shall be added to vertical glazing, and shall be input as 1/4 north, 1/4 east, 1/4 south and 1/4 west facing.
3. Lighting loads shall be determined according to Table 15-1.
4. Equipment loads shall be determined from Table 3-1 of RS-29.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1331, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1332 Component U-factors. The U-factors for typical construction assemblies are included in Chapter 20. These values shall be used for all calculations. Where proposed construction assemblies are not represented in Chapter 20, values shall be calculated in accordance with Chapters 19-27 in RS-27 listed in Chapter 17, using the framing factors listed in Chapter 20. For envelope assemblies containing metal framing, the U-factor shall be determined by one of the following methods:

1. Results of laboratory measurements according to acceptable methods of test.
2. Standard RS-25, listed in Chapter 17, where the metal framing is bonded on one or both sides to a metal skin or covering.
3. The zone method as provided in Chapter 22 of RS-27, listed in Chapter 17.
4. Effective framing/cavity R-values as provided in Table 20-5A.

When return air ceiling plenums are employed, the roof/ceiling assembly shall:

a. For thermal transmittance purposes, not include the ceiling proper nor the plenum space as part of the assembly; and
b. For gross area purposes, be based upon the interior face of the upper plenum surface.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1332, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1333 UA calculations. The target UA_t and the proposed UA_p shall be calculated using Equations 13-1 and 13-2 and the corresponding areas and U-factors from Table 13-1 or 13-2. For the target UA_t calculation, the overhead glazing shall be located in roof/ceiling area and the remainder of the glazing allowed per Table 13-1 or 13-2 shall be located in the wall area.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1333, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1334 Solar heat gain coefficient. Solar heat gain coefficient shall comply with Section 1323.3.

EQUATION 13-1:

Target UA_t

$$UA_t = U_{rat}A_{rat} + U_{ograt}A_{ograt} + U_{ort}A_{ort} + U_{ogort}A_{ogort} + U_{wt}A_{wt} + U_{dt}A_{dt} + U_{vgt}A_{vgt} + U_{ft}A_{ft} + F_{st}P_{st} + U_{bgwt}A_{bgwt}$$

UA_t = The target combined specific heat transfer of the gross roof/ceiling assembly, exterior wall and floor area.

Where:

U_{rat} = The thermal transmittance value for roofs over attics found in Table 13-1 or 13-2.

U_{ograt} = The thermal transmittance for overhead glazing found in Table 13-1 or 13-2 which corresponds to the proposed total glazing area as a percent of gross exterior wall area.

U_{ort} = The thermal transmittance value for other roofs found in Table 13-1 or 13-2.

U_{ogort} = The thermal transmittance for overhead glazing found in Table 13-1 or 13-2 which corresponds to the proposed total glazing area as a percent of gross exterior wall area.

U_{wt} = The thermal transmittance value for opaque walls found in Table 13-1 or 13-2.

U_{vgt} = The thermal transmittance value for vertical glazing found in Table 13-1 or 13-2 which corresponds to the proposed total glazing area as a percent of gross exterior wall area.

U_{dt} = The thermal transmittance value for opaque doors found in Table 13-1 or 13-2.

U_{ft} = The thermal transmittance value for floors over unconditioned space found in Table 13-1 or 13-2.

F_{st} = The F-factor for slab-on-grade and radiant slab floors found in Table 13-1 or 13-2.

U_{bgwt} = The thermal transmittance value for opaque walls found in Table 13-1 or 13-2.

A_{dt} = The proposed opaque door area, A_d

A_{ft} = The proposed floor over unconditioned space area, A_f.

P_{st} = The proposed lineal feet of slab-on-grade and radiant slab floor perimeter, P_s.

A_{bgwt} = The proposed below grade wall area, A_{bgw}.

and;

if the total amount of glazing area as a percent of gross exterior wall area does not exeed the maximum allowed in Table 13-1 or 13-2:

A_{rat} = The proposed roof over attic area, A_{ra}.

A_{ograt} = The proposed overhead glazing area in roofs over attics, A_{ogra}.

A_{ort} = The proposed other roof area, A_{or}.

A_{ogort} = The proposed overhead glazing area in other roofs, A_{ogor}.

A_{wt} = The proposed opaque above grade wall area, A_{w}.

A_{vgt} = The proposed vertical glazing area, A_{vg}.

or;

if the total amount of glazing area as a percent of gross exterior wall area exceeds the maximum allowed in Table 13-1 or 13-2:

A_{rat} = The greater of:
the proposed roof over attic area, and
the gross roof over attic area minus A_{ograt}.

A_{ograt} = The lesser of:
proposed overhead glazing area in roofs over attics, and
the maximum allowed glazing area from Table 13-1 or 13-2.

A_{ort} = The greater of:
the proposed other roof area, and
the gross other roof area minus A_{ogort}.

A_{ogort} = The lesser of:
the proposed overhead glazing area in other roofs, and
the maximum allowed glazing area from Table 13-1 or 13-2 minus A_{ograt}.

A_{wt} = The greater of:
proposed opaque above grade wall area, and
the gross exterior above grade wall area minus A_{dt} minus A_{vgt}.

A_{vgt} = The lesser of:
the proposed vertical glazing area, and
the maximum allowed glazing area from Table 13-1 or 13-2 minus A_{ograt} minus A_{ogort}.

EQUATION 13-2

Proposed UA_p

$$UA_p = U_{ra}A_{ra} + U_{or}A_{or} + U_{og}A_{og} + U_wA_w + U_dA_d + U_{vg}A_{vg} + U_fA_f + F_sP_s + U_{bgw}A_{bgw}$$

Where:

UA_p = The combined proposed specific heat transfer of the gross exterior wall, floor, and roof/ceiling assembly area.

U_{ra} = The thermal transmittance of the roof over attic area.
A_{ra} = Opaque roof over attic area.

U_{or} = The thermal transmittance of the other roof area.
A_{or} = Opaque other roof area.

U_{og} = The thermal transmittance for the overhead glazing
A_{og} = Overhead glazing area.

U_w = The thermal transmittance of the opaque wall area.
A_w = Opaque above grade wall area (not including opaque doors).

U_{vg} = The thermal transmittance of the vertical glazing area.
A_{vg} = Vertical glazing area.

U_d = Thermal transmittance value of opaque door area.
A_d = Opaque door area.

U_f = The thermal transmittance of the floor over unconditioned space area.
A_f = Floor area over unconditioned space.

F_s = Slab-on-grade or radiant floor component F-factor.
P_s = Lineal feet of slab-on-grade or radiant floor perimeter.

U_{bgw} = The thermal transmittance value of the below grade wall area.
A_{bgw} = Below grade wall area as defined in Tables 13-1 or 13-2.

NOTE: Where more than one type of wall, window, roof/ceiling, door, and skylight is used, the U and A terms for those items shall be expanded into sub-elements as:

$$U_{w1}A_{w1} + U_{w2}A_{w2} + U_{w3}A_{w3} + \ldots\text{etc.}$$

TABLE 13-1
BUILDING ENVELOPE REQUIREMENTS FOR CLIMATE ZONE 1

MINIMUM INSULATION R-VALUES OR MAXIMUM COMPONENT U-FACTORS FOR ZONE 1

Building Components

Space Heat Type	Components					
	Roofs Over Attic	All Other Roofs	Opaque Walls[1,2]	Opaque Doors	Floor Over Uncond Space	Slab On Grade[5]
1. Electric resistance heat	R-38 or U=0.031	R-30 or U=0.034	R-19 or U=0.062[3]	U=0.60	R-30 or U=0.029	R-10 or F=0.54
2. All others including Heat pumps and VAV	R-30 or U=0.036	R-21 or U=0.050	R-11 or U=0.14	U=0.60	R-19 or U=0.056	R-10 or F=0.54

MAXIMUM GLAZING AREAS AND U-FACTORS AND MAXIMUM GLAZING SOLAR HEAT GAIN COEFFICIENTS FOR ZONE 1

Glazing

Maximum Glazing Area as % of Wall	0% to 15%			>15% to 20%			>20% to 30%			>30% to 40%		
	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]
	VG	OG		VG	OG		VG	OG		VG	OG	
1. Electric resistance heat	0.40	0.80	1.0	0.40	0.80	1.0	PRESCRIPTIVE PATH NOT ALLOWED					
2. All others including Heat pumps and VAV	0.90	1.45	1.0	0.75	1.40	1.0	0.60	1.30	0.65	0.50	1.25	0.45

Footnotes

1. **Below Grade Walls:** Below grade walls shall be insulated either on the interior or the exterior. Below grade walls insulated on the exterior shall use a minimum of R-10 insulation. Below grade walls insulated on the interior shall use opaque wall values. No insulation is required for those portions of below grade walls and footings that are more than ten feet below grade. Below grade walls, however, shall not be included in the gross exterior wall area unless insulated to the levels given above.
2. **Concrete Masonry Walls:** If the area weighted heat capacity of the total opaque above grade wall is a minimum of 9.0 Btu/ft^2 • °F, then the U-factor may be increased to 0.19 for interior insulation and 0.25 for integral and exterior insulation for insulation position as defined in Chapter 12. Individual walls with heat capacities less than 9.0 Btu/ft^2 • °F and below grade walls shall meet opague wall requirements listed above. Glazing shall comply with the following:

Maximum Glazing Area as % of Wall	0 to 15 %			>15% to 20 %			>20% to 25 %		
	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]
	VG	OG		VG	OG		VG	OG	
1. Electric resistance heat	0.40	0.80	1.0	0.40	0.80	1.0	NOT ALLOWED		
2. All others including Heat pumps and VAV	0.75	1.40	1.0	0.65	1.30	0.80	0.60	1.30	0.65

3. **Metal Stud Walls:** For metal stud construction U=0.11.
4. **SHGC (Solar Heat Gain Coefficient per Section 1312.2):** May substitute Maximum Shading Coefficient (SC) for SHGC. (See Section 1210 for definition of Shading Coefficient)..
5. **Radiant Floors:** Where insulation is required under the entire slab, radiant floors shall use a minimum of R-10 insulation or F-0.55 maximum. Where insulation is not required under the entire slab, radiant floors shall use R-10 perimeter insulation according to Section 1311.6 or F-0.78 maximum.

TABLE 13-2
BUILDING ENVELOPE REQUIREMENTS FOR CLIMATE ZONE 2

MINIMUM INSULATION R-VALUES OR MAXIMUM COMPONENT U-FACTORS FOR ZONE 2

Building Components

Space Heat Type	Components					
	Roofs Over Attic	All Other Roofs	Opaque Walls[1,2]	Opaque Doors	Floor Over Uncond Space	Slab On Grade
1. Electric resistance heat	R-38 or U=0.031	R-30 or U=0.034	R-24 or U=0.044[3]	U=0.60	R-30 or U=0.029	R-10 or F=0.54
2. All others including Heat pumps and VAV	R-38 or U=0.031	R-25 or U=0.040	R-19 or U=0.11	U=0.60	R-21 or U=0.047	R-10 or F=0.54

MAXIMUM GLAZING AREAS AND U-FACTORS AND MAXIMUM GLAZING SOLAR HEAT GAIN COEFFICIENTS FOR ZONE 2

Glazing

Maximum Glazing Area as % of Wall	0% to 15%			>15% to 20%			>20% to 25%			>25% to 30%		
	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]
	VG	OG		VG	OG		VG	OG		VG	OG	
1. Electric resistance heat	0.40	0.80	1.0	0.40	0.80	1.0	PRESCRIPTIVE PATH NOT ALLOWED					
2. All others including Heat pumps and VAV	0.90	1.45	1.0	0.75	1.40	1.0	0.60	1.30	0.60	0.50	1.25	0.50

Footnotes

1. **Below Grade Walls:** Below grade walls shall be insulated either on the interior or the exterior. Below grade walls insulated on the exterior shall use a minimum of R-12 insulation. Below grade walls insulated on the interior shall use opaque wall values. No insulation is required for those portions of below grade walls and footings that are more than ten feet below grade. Below grade walls, however, shall not be included in the gross exterior wall area unless insulated to the levels given above.
2. **Concrete Masonry Walls:** If the area weighted heat capacity of the total opaque above grade wall is a minimum of 9.0 Btu/ft^2 • °F, then the U-factor may be increased to 0.19 for interior insulation and 0.25 for integral and exterior insulation for insulation position as defined in Chapter 12. Individual walls with heat capacities less than 9.0 Btu/ft^2 • °F and below grade walls shall meet opague wall requirements listed above. Glazing shall comply with the following:

Maximum Glazing Area as % of Wall	0 to 5 %			>5% to 7 %			>7% to 10 %		
	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]
	VG	OG		VG	OG		VG	OG	
1. Electric resistance heat	0.40	0.80	1.0	0.40	0.80	1.0	0.40	0.80	1.0
2. All others including Heat pumps and VAV	0.75	1.40	0.85	0.60	1.30	0.70	0.50	1.25	0.45

3. **Metal Stud Walls:** For metal stud construction U=0.10.
4. **SHGC (Solar Heat Gain Coefficient per Section 1312.2):** May substitute Maximum Shading Coefficient (SC) for SHGC. (See Section 1210 for definition of Shading Coefficient).
5. **Radiant Floors:** Where insulation is required under the entire slab, radiant floors shall use a minimum of R-10 insulation or F-0.55 maximum. Where insulatin is not required under the entire slab, radiant floors shall use R-10 perimeter insualtion according to Section 1311.6 or F-0.78 maximum.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1334, filed 10/18/93, effective 4/1/94.]

CHAPTER 14
BUILDING MECHANICAL SYSTEMS

WAC 51-11-1401 Scope. This section covers the determination of requirements, system and component performance, control requirements and duct construction.

EXCEPTION:Special applications, including but not limited to hospitals, laboratories, thermally sensitive equipment, and rooms designed to comply with the special construction and fire protection requirements of NFPA 75, "Standard for the Protection of Electronic Computer/Data Processing Equipment" may be exempt from the requirements of this section when approved by the building official. Exemptions shall be specific on a case-by-case basis and allowed only to the extent necessary to accommodate the special applications.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1401, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1402 Mechanical ventilation. The minimum requirements for ventilation shall comply with the Washington State Ventilation and Indoor Air Quality Code (chapter 51-13 WAC).

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1402, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1410 General requirements. The building mechanical system shall comply with Sections 1411 through 1415, Sections 1440 through 1442 and Sections 1450 through 1454, and with one of the following paths:

a.Simple Systems (Packaged Unitary Equipment) Sections 1420 through 1424.
b.Complex Systems Sections 1430 through 1438.
c.Systems Analysis. See Section 1141.4.

FIGURE 14A
Mechanical Systems Compliance Paths

Section Number	Subject	Simple Systems Path	Complex Systems Path	Systems Analysis Option
1410	General Requirements	X	X	X
1411	HVAC Equipment Performance Requirements	X	X	X
1412	Controls	X	X	X
1413	Air Economizers	X	X	X
1414	Ducting Systems	X	X	X
1415	Piping Systems	X	X	X
1420	Simple Systems (Packaged Unitary Equipment)	X		
1421	System Type	X		
1422	Controls	X		
1423	Economizers	X		
1424	Separate Air Distribution Systems	X		
1430	Complex Systems		X	
1431	System Type		X	
1432	Controls		X	
1433	Economizers		X	
1434	Separate Air Distribution Systems		X	
1435	Simultaneous Heating and Cooling		X	
1436	Heat Recovery		X	
1437	Electric Motor Efficiency		X	
1438	Variable Flow Systems		X	
RS-29	Systems Analysis			X
1440	Service Water Heating	X	X	X
1441	Water Heater Installation	X	X	X
1442	Shut Off Controls	X	X	X
1450	Heated Pools	X	X	X
1451	General	X	X	X
1452	Pool Water Heaters	X	X	X
1453	Controls	X	X	X
1454	Pool Covers	X	X	X

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1410, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1411 HVAC equipment performance requirements.

1411.1 General: Equipment shall have a minimum performance at the specified rating conditions not less than the values shown in Tables 14-1 through 14-3.

1411.2 Rating Conditions: Cooling equipment shall be rated at ARI test conditions and procedures when available. Where no applicable procedures exist, data shall be furnished by the equipment manufacturer.

1411.3 Combination Space and Service Water Heating: Equipment whose listed principal function is service water heating and which is used to provide additional functions (e.g., space heating) as part of a combination system, shall comply with minimum performance requirements for the principal function category.

1411.4 Packaged Electric Heating and Cooling Equipment: Packaged electric equipment providing both heating and cooling with a total cooling capacity greater than 20,000 Btu/h shall be a heat pump.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1411, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1412 Controls.

1412.1 Temperature Controls: Each system shall be provided with at least one temperature control device. Each zone shall be controlled by individual thermostatic controls

responding to temperature within the zone. At a minimum, each floor of a building shall be considered as a separate zone.

1412.2 Deadband Controls: When used to control both comfort heating and cooling, zone thermostatic controls shall be capable of a deadband of at least 5 degrees F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

EXCEPTIONS:
1. Special occupancy, special usage, or code requirements where deadband controls are not appropriate.
2. Buildings complying with Section 1141.4, if in the proposed building energy analysis, heating and cooling thermostat setpoints are set to the same temperature between 70 degrees F and 75 degrees F inclusive, and assumed to be constant throughout the year.
3. Thermostats that require manual changeover between heating and cooling modes.

1412.3 Humidity Controls: If a system is equipped with a means for adding moisture, a humidistat shall be provided.

1412.4 Setback and Shut-Off: HVAC systems shall be equipped with automatic controls capable of accomplishing a reduction of energy use through control setback or equipment shutdown during periods of non-use or alternate use of the spaces served by the system. The automatic controls shall have a minimum seven-day clock and be capable of being set for seven different day types per week.

EXCEPTIONS:
1. Systems serving areas which require continuous operation at the same temperature setpoint.
2. Equipment with full load demands of 2 Kw (6,826 Btu/h) or less may be controlled by readily accessible manual off-hour controls.

1412.4.1 Dampers: Outside air intakes, exhaust outlets and relief outlets serving conditioned spaces shall be equipped with dampers which close automatically when the system is off or upon power failure. Stair shaft and elevator shaft smoke relief openings shall be equipped with normally open dampers. These dampers shall remain closed in normal operation until activated by the fire alarm system or other approved smoke detection system.

EXCEPTIONS:
1. Systems serving areas which require continuous operation.
2. Combustion air intakes.

1412.5 Heat Pump Controls: Unitary air cooled heat pumps shall include microprocessor controls that minimize supplemental heat usage during start-up, set-up, and defrost conditions. These controls shall anticipate need for heat and use compression heating as the first stage of heat. Controls shall indicate when supplemental heating is being used through visual means (e.g., LED indicators).

1412.6 Combustion Heating Equipment Controls: Combustion heating equipment with a capacity over 225,000 Btu/h shall have modulating or staged combustion control.

EXCEPTIONS:
1. Boilers.
2. Radiant heaters.

1412.7 Balancing: Each air supply outlet or air or water terminal device shall have a means for balancing, including but not limited to, dampers, temperature and pressure test connections and balancing valves.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1412, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1413 Air economizers.

1413.1 Operation: Air economizers shall be of automatically modulating outside and return air dampers to provide 100 percent of the design supply air as outside air to reduce or eliminate the need for mechanical cooling.

1413.2 Control: Air economizers shall be controlled by a control system capable of determining if outside air can meet part or all of the building's cooling loads.

1413.3 Integrated Operation: Building Heating Energy: Air economizers shall be capable of providing partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load. Controls shall not preclude the economizer operation when mechanical cooling is required simultaneously.

EXCEPTION: Economizers on individual, direct expansion, cooling systems with capacities not greater than 75,000 Btu/h may include controls that limit simultaneous operation of the economizer and mechanical cooling for the purpose of preventing ice formation on cooling coils.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1413, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1414 Ducting systems.

1414.1 Sealing: Duct work which is designed to operate at pressures above 1/2 inch water column static pressure shall be sealed in accordance with RS-18. Extent of sealing required is as follows:
1. Static pressure: 1/2 inch to 2 inches; seal transverse joints.
2. Static pressure: 2 inches to 3 inches; seal all transverse joints and longitudinal seams.
3. Static pressure: Above 3 inches; seal all transverse joints, longitudinal seams and duct wall penetrations.

1414.2 Insulation: Ducts and plenums that are constructed as part of the building envelope shall meet the requirements of Chapter 13. Other ducts and plenums shall be thermally insulated per Table 14-5.

EXCEPTIONS:
1. Within the HVAC equipment.
2. Exhaust air ducts not subject to condensation.
3. Exposed ductwork within a space that serves that space only.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1414, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1415 Piping systems.

1415.1 Insulation: Piping shall be thermally insulated in accordance with Table 14-6.

EXCEPTION: Piping installed within unitary HVAC equipment.

Water pipes outside the conditioned space shall be insulated in accordance with Washington State Plumbing Code (chapter 51-26 WAC).

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1415, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1420 Simple systems (packaged unitary equipment).

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1420, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1421 System type. To qualify as a simple system, systems shall be one of the following:

a. Air cooled, constant volume packaged equipment, which provide heating, cooling or both, and require only external connection to duct work and energy services.
b. Air cooled, constant volume split systems, which provide heating, cooling or both, with cooling capacity of 54,000 Btu/h or less.
c. Heating only systems which have a capacity of less than 5,000 cfm or which have a minimum outside air supply of less than 70 percent of the total air circulation.

All other systems shall comply with Sections 1430 through 1438.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1421, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1422 Controls. In addition to the control requirements in Section 1412, where separate heating and cooling equipment serve the same temperature zone, thermostats shall be interlocked to prevent simultaneous heating and cooling.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1422, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1423 Economizers. Economizers meeting the requirements of Section 1413 shall be installed on packaged roof top fan-cooling units having a supply capacity of greater than 1,900 cfm or a total cooling capacity greater than 54,000 Btu/h.

The total capacity of all units without economizers shall not exceed 240,000 Btu/h per building.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1423, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1424 Separate air distribution systems. Zones with special process temperature requirements and/or humidity requirements shall be served by separate air distribution systems from those serving zones requiring only comfort conditions.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1424, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1430 Complex systems.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1430, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1431 System type. All systems not qualifying for Sections 1420 through 1424 (Simple Systems), including field fabricated and constructed of system components, shall comply with Sections 1430 through 1438. Simple systems may also comply with Sections 1430 through 1438.

1431.1 Field-Assembled Equipment and Components: Field-assembled equipment and components from more than one manufacturer shall show compliance with this section and Section 1411 through calculations of total on-site energy input and output. The combined component efficiencies as measured per Section 1411.2, shall be in compliance with the requirements of Section 1411.1.

Total on-site energy input to the equipment shall be determined by combining the energy inputs to all components, elements, and accessories such as compressor(s), internal circulating pump(s), purge devices, viscosity control heaters, and controls.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1431, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1432 Controls.

1432.1 Setback and Shut-off: Systems that serve zones with different uses, as defined in Table 15-1

1. Shall be served by separate systems, or
2. Shall include isolation devices and controls to shut off or set back the supply of heating and cooling to each zone independently.

EXCEPTION: Isolation or separate systems are not required for zones expected to operate continuously or expected to be inoperative only when all other zones are inoperative.

1432.2 Systems Temperature Reset Controls

1432.2.1 Air Systems for Multiple Zones: Systems supplying heated or cooled air to multiple zones shall include controls which automatically reset supply air temperatures by representative building loads or by outside air temperature. Temperature shall be reset by at least 25 percent of the design supply-air-to-room-air temperature difference.

EXCEPTION: Where specified humidity levels are required to satisfy process needs, such as computer rooms or museums.

1432.2.2 Hydronic Systems: Systems with a design capacity of 600,000 Btu/h or greater supplying heated water to comfort conditioning systems shall include controls which automatically reset supply water temperatures by representative building loads (including return water temperature) or by outside air temperature. Temperature shall be reset by at least 25 percent of the design supply-to-return water temperature differences.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1432, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1433 Economizers. Economizers meeting the requirements of Section 1413 shall be installed on the following systems:

a. Packaged roof top fan-cooling units with a supply capacity of greater than 1,900 cfm or a total cooling capacity greater than 54,000 Btu/h.
b. Other individual fan-cooling units with a supply capacity of greater than 2,800 cfm or a total cooling capacity greater than 84,000 Btu/h.

The total capacity of all units without economizers shall not exceed 240,000 Btu/h per building.

EXCEPTIONS:

1. Systems with air or evaporatively cooled condensers and that either one of the following can be demonstrated to the satisfaction of the enforcing agency:
   a. Special outside air filtration and treatment, for the reduction and treatment of unusual outdoor contaminants, makes an air economizer infeasible.
   b. The use of outdoor air cooling affects the operation of other systems (such as humidification, dehumidification, and supermarket refrigeration systems) so as to increase the overall building energy consumption.
2. Systems for which at least 75 percent of the annual energy used for mechanical cooling is provided from site-recovery or site-solar energy source.
3. A water economizer system, which is capable of cooling supply air by indirect evaporation. Such a system shall be designed and capable of being controlled to provide 100 percent of the expected system cooling load at outside air temperatures of 50 degrees F dry-bulb/45 degrees F wet-bulb and below. For this calculation, all factors including solar and internal load shall be the same as those used for peak load calculations, except for the outside air temperatures.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1433, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1434 Separate air distribution systems. Zones with special process temperature requirements and/or humidity requirements shall be served by separate air distribution systems from those serving zones requiring only comfort conditions; or shall include supplementary control provisions so that the primary systems may be specifically controlled for comfort purposes only.

EXCEPTION: Zones requiring only comfort heating or comfort cooling that are served by a system primarily used for process temperature and humidity control provided that:
1. The total supply air to those comfort zones is no more than 25 percent of the total system supply air, or
2. The total conditioned floor area of the zones is less than 1,000 ft^2.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1434, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1435 Simultaneous heating and cooling. Systems which provide heating and cooling simultaneously to a zone are prohibited. Zone thermostatic and humidistatic controls shall be capable of operating in sequence the supply of heating and cooling energy to the zone. Such controls shall prevent:
   a. Reheating for temperature control.
   b. Recooling for temperature control.
   c. Mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by economizer systems, for all air in excess of that required by the Washington State Ventilation and Indoor Air Quality Code (WAC 51-13) or by mechanical refrigeration.
   d. Other simultaneous operation of heating and cooling systems to the same zone.

EXCEPTIONS:
1. Variable air volume systems which have fan-powered terminal units on the perimeter zones controlled to utilize plenum heat prior to new energy being used for morning warm-up; and which, during periods of occupancy, are designed to reduce the air supply to each zone to a minimum before reheating, recooling, or mixing takes place. The minimum volume of air from the main supply duct shall be no greater than the minimum required to meet ventilation requirements of the Washington State Ventilation and Indoor Air Quality Code (WAC 51-13).
2. Zones having special pressurization relationships or cross-contamination requirements.
3. Where at least 75 percent of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered or site-solar energy source.
4. Zones where specific humidity levels are required.
5. Zones with a peak supply air quantity of 300 cfm or less.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1435, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1436 Heat recovery. Fan systems which have both a capacity of 5,000 cfm or greater and which have a minimum outside air supply of 70 percent or greater of the total air circulation shall have a heat recovery system with at least 50 percent recovery effectiveness. Fifty percent heat recovery effectiveness shall mean an increase in the outside air supply temperature at design heating conditions of one half the difference between the outdoor design air temperature and 65 degrees F. Provision shall be made to bypass or control the heat recovery system to permit air economizer operation as required by Section 1433. Heat recovery energy may be provided from any site-recovered or site-solar source.

EXCEPTIONS:
1. Laboratory systems equipped with both variable air volume supply and variable air volume or two-speed exhaust fume hoods.
2. Systems serving spaces heated to less than 60 degrees F.
3. Systems which can be shown to use as much energy with the addition of heat recovery equipment as without it.
4. Systems exhausting toxic, flammable, paint exhaust or corrosive fumes making the installation of heat recovery equipment impractical.
5. Type I commercial kitchen hoods.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1436, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1437 Electric motor efficiency. Design A & B squirrel-cage, T-frame induction permanently wired polyphase motors of 1 hp or more having synchronous speeds of 3,600, 1,800 and 1,200 rpm shall have a nominal full-load motor efficiency no less than the corresponding values for energy efficient motors provided in Table 14-4.

EXCEPTIONS:
1. Motors used in systems designed to use more than one speed of a multi-speed motor.
2. Motors used as a component of the equipment meeting the minimum equipment efficiency requirements of Section 1411 and Tables 14-1 and 14-2 provided that the motor input is included when determining the equipment efficiency.
3. Motors that are an integral part of specialized process equipment.
4. Where the motor is integral to a listed piece of equipment for which no complying motor has been approved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1437, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1438 Variable flow systems. For fans and pumps greater than 10 horsepower, where the application involves variable flow, there shall be variable frequency drives or variable flow devices installed. Acceptable variable flow devices include variable inlet vanes, variable blade pitch, and variable fan geometry. Throttling valves (dampers), scroll dampers or bypass circuits shall not be allowed.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1438, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1440 Service water heating.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1440, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1441 Water heater installation. Electric water heaters in unconditioned spaces or on concrete floors shall be placed on an incompressible, insulated surface with a minimum thermal resistance of R-10.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1441, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1442 Shut-off controls. Systems designed to maintain usage temperatures in hot water pipes, such as circulating hot water systems or heat traced pipes shall be equipped with automatic time switches or other controls to turn off the system during periods of nonuse.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1442, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1450 Heated pools.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1450, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1451 General. The requirements in this section apply to "general and limited use pools" as defined in the Washington Water Recreation Facilities Regulations (chapter 246-260 WAC).

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1451, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1452 Pool water heaters. Pool water heaters using electric resistance heating as the primary source of heat are prohibited for pools over 2,000 gallons.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1452, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1453 Controls. All pool heaters shall be equipped with readily accessible ON/OFF switch to allow shutting off the operation of the heater without adjusting the thermostat setting. Controls shall be provided to allow the water temperature to be regulated from the maximum design temperature down to 65 degrees F.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1453, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1454 Pool covers. Heated pools shall be equipped with a vapor retardant pool cover on or at the water surface. Pools heated to more than 90 degrees F shall have a pool cover with a minimum insulation value of R-12.

TABLE 14-1

Standard Rating Conditions and Minimum Performance for Air Cooled Unitary Air Conditioners, Heat Pumps, Packaged Terminal Air Conditioners, Warm Air Furnaces, Duct Furnaces and Unit Heaters

Equipment Type & Rating	Category	Sub-category & Rating Conditions	Minimum Rating		Standard
			Steady State	Seasonal or Part Load	
Air Conditioners and Heat Pumps Cooling Ratings	≤65,000 Btu/h Cooling Capacity	Split Systems	(N/A)	10.0 SEER	ARI 210/240 -1989
		Single Package	(N/A)	9.7 SEER	
	>65,000 and ≤135,000 Btu/h Cooling Capacity	All Unitary Standard Ratings:	8.9 EER 95°F db	8.3 IPLV 80°F db	
	>135,000 and ≤760,000 Btu/h [1] Cooling Capacity	Air Conditioners	8.5 EER	7.5 IPLV	ARI 360 -1986
		Heat Pumps	8.5 EER	7.5 IPLV	
	>760,000 Btu/h[1] Cooling Capacity	Air Conditioners	8.2 EER	7.5 IPLV	
		Heat Pumps	8.7 EER	7.5 IPLV	
Packaged Term. Air Conditioners & Heat Pumps Cooling Ratings	All Capacities	Air Conditioners and Heat Pumps Standard/Low Temp	10.0 - (0.16 x Cap/1000)[3] EER 95°F	12.2 - (0.20 x Cap/1000)[2,3] EER 82°F	ARI 310 -1990
Heat Pump Heating Ratings	≤65,000 Btu/h Cooling Capacity	Split Systems		6.8 HSPF	ARI 210/240 -1989
		Single Package		6.6 HSPF	
	>65,000 and ≤135,000 Btu/h Cooling Capacity	All Unitary Standard Ratings:	3.0 COP 47°F db/43°F wb	2.0 COP 17°F db/15°F wb	
	>135,000 Btu/h Cooling Capacity	Standard Ratings	2.9 COP 47 °F	2.0 COP 17 °F	ARI 365 -1986
Packaged Term. Heat Pumps Heating Ratings	All Capacities	Heat Pumps Standard Ratings	2.9 - (0.026x Cap/1000)[3] EER 47°F db/	43°F wb	ARI 380 -1990
Warm Air Furnaces & Combination Furnace/A.C.	<225,000 Btu/h	Gas and Oil Fired Seasonal Ratings	80% E_t[4]	78% AFUE[5]	DOE 10CFR Part430 AppN
	≥225,000 Btu/h	Gas, Max Rating[6]	80% E_t[4]	(N/A)	ANSI Z21.47 -1983
		Gas, Min Rating[6]	78% E_t[4]	(N/A)	
	≥225,000 Btu/h	Oil, Max Rating[6]	81% E_t[4]	(N/A)	UL 727 -1986
		Oil, Min Rating[6]	81% E_t[4]	(N/A)	
Warm-Air Duct Furnaces and Unit Heaters	All Size Gas Duct Furnaces	Max Rated Capacity[6]	78% E_t[4]	(N/A)	ANSI Z83.9
		Min Rated Capacity[6]	75% E_t[4]	(N/A)	-1986
	All Size Gas Unit Heaters	Max Rated Capacity[6]	78% E_t[4]	(N/A)	ANSI Z83.8
		Min Rated Capacity[6]	74% E_t[4]	(N/A)	-1985
	All Size Oil Unit Heaters	Max Rated Capacity[6]	81% E_t[4]	(N/A)	UL 731 -1988
		Min Rated Capacity[6]	81% E_t[4]	(N/A)	

1. For units that have a heating section, deduct 0.2 from all required EER's and IPLV's.
2. For multi-capacity equipment the minimum performance shall apply to each step provided Multi-capacity refers to manufacturer publishe rating for more than one capacity mode allowed by the product's controls.
3. Capacity (Cap) means the rated cooling capacity of the product in Btu/h in accordance with the cited ARI standard. If the unit's capacity is less than 7,00 Btu/h, use 7,000 Btu/h in the calculation. If the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculation.
4. These values apply to non-NAECA equipment. See referenced standard for definition of Thermal efficiency (Et), (100% flue losses).
5. To be consistent with National Appliance Energy Conservation Act (NAECA) of 1987 (Public Law 100-12). These values apply to furnace and combination units covered by NAECA.
6. Minimum and maximum ratings as provided for and allowed by the unit's controls.

TABLE 14-2

Standard Rating Conditions and Minimum Performance for Water and Evaporatively Cooled Unitary Air Conditioners, Heat Pumps, Water Source and Ground Source Heat Pumps, Condensing Units, and Water Chilling Packages

Equipment Type & Rating	Category	Sub-category & Rating Conditions	Minimum Rating		Standard
			Steady State	Seasonal or Part Load	
Evaporatively Cooled A/Cs & Heat Pumps Cooling Ratings	≤65,000 Btu/h Cooling Capacity	Standard Conditions[1]: Outdoor Conditions: 95°F db/75°F wb	9.3 EER	8.5 IPLV	ARI 210/240 -1989 CTI 201 -1986
	>65,000 and ≤135,000 Btu/h Cooling Capacity		10.5 EER	9.7 IPLV	
Water Source Heat Pump Cooling Ratings	≤65,000 Btu/h Cooling Capacity	Standard Conditions[1]: Entering Water:	9.3 EER 85°F ewt[2]	10.2 EER 75°F ewt[2]	ARI 320 -1986
	>65,000 and ≤135,000 Btu/h Cooling Capacity	Standard Conditions[1]: Entering Water:	10.5 EER 85°F ewt[2]	(NA)	CTI 201 -1986
Ground Water Heat Pump Cooling Ratings	<135,000 Btu/h Cooling Capacity	Standard Conditions[1]: Entering Water:	11.0 EER 70°F ewt[2]	11.5 EER 50°F ewt[2]	ARI 325 -1985
Water Cooled Unitary Air Conditioners Cooling Ratings	≤65,000 Btu/h Cooling Capacity	Standard Conditions[1]: Entering Water:	9.3 EER 85°F ewt[2]	8.3 IPLV 75°F ewt[2]	ARI 210/240 -1989
	>65,000 and ≤135,000 Btu/h Cooling Capacity	Standard Conditions[1]: Entering Water:	10.5 EER 85°F ewt[2]	(NA)	CTI 201 -1986
Water/Evap Cooled Air Cond. and Heat Pumps Cooling Ratings	>135,000 Btu/h Cooling Capacity	Standard Conditions[1]:	9.6 EER	9.0 IPLV	ARI 360 -1986 CTI 201 -1986
Air and Water/ Evap Cooled Condensing Units Cooling Ratings[3]	>135,000 Btu/h Cooling Capacity	Air Cooled	9.9 EER	11.0 IPLV	ARI 365 -1987 CTI 201 -1986
		Water/Evap Cooled	12.9 EER	12.9 IPLV	
Air and Water Cooled Water Chilling Packages Cooling Ratings	<150 Tons	Water Cooled	3.8 COP	3.9 IPLV	ARI 550-90 ARI 590-86pN CTI 201 -1986
	≥150 and <300 Tons		4.2 COP	4.5 IPLV	
	≥300 Tons		5.2 COP[4]	5.3 IPLV[4]	
	<150 Tons	Air Cooled with Condenser	2.7 COP	2.8 IPLV	
	≥150 Tons		2.5 COP	2.5 IPLV	
	All Capacities	Air Cooled Condenserless	3.1 COP	3.2 IPLV	
Water & Ground-Water Source Heat Pumps Heating Ratings	<135,000 Btu/h Cooling Capacity	Water Source Standard Conditions[1]:	3.8 COP 70°F ewt[2]	(N/A) (N/A)	ARI 320 -1986
		Ground Water Source Standard Conditions[1]:	3.4 COP 70°F ewt[2]	3.0 COP 50°F ewt[2]	ARI 325 -1985

1. Standard Indoor Conditions: 80°F dry bulb and 67°F wet bulb.
2. ewt: Entering Water Temperature for water cooled heat pumps and air conditioners.
3. Condensing unit requirements are based on single - number rating defined in paragraph 5.1.3.2 of ARI Standard 365.
4. These requirements are reduced to 4.7 COP and 4.8 IPLV, where refrigerants with ozone depletion factors of 0.05 or less are used. No reduction is allowed for standard design systems analyzed under RS-29.

TABLE 14-3

Standard Rating Conditions and Minimum Performance, Gas- and Oil-Fired Boilers

Reference	Category	Rating Condition	Minimum Performance
DOE Test Procedure 10 CFR, Part 430 AppN	Gas-Fired <300,000 Btu/h	Seasonal Rating	AFUE 80%[1,3]
	Oil-Fired <300,000 Btu/h	Seasonal Rating	AFUE 80%[1]
ANSI Z21.13-87 H.I. Htg. Boiler Std. 86 ASME PTC4.1-64 U.L. 795-73	Gas-Fired ≥300,000 Btu/h	1. Max. Rated Capacity[2] Steady-State	E_c[4] 80%
		2. Min. Rated Capacity[2] Steady-State	E_c[4] 80%
U.L. 726-75 H.I. Htg. Boiler Std. 86 ASME PTC4.1-64	Oil-Fired ≥300,000 Btu/h	1. Max. Rated Capacity[2] Steady-State	E_c[4] 83%
		2. Min. Rated Capacity[2] Steady-State	E_c[4] 83%
H.I. Htg. Boiler Std. 86 ASME PTC4.1-64	Oil-Fired (Residual) ≥300,000 Btu/h	1. Max. Rated Capacity[2] Steady-State	E_c[4] 83%
		2. Min. Rated Capacity[2] Steady-State	E_c[4] 83%

1. To be consistent with National Appliance Energy Conservation Act of 1987 (P.L. 100-12).
2. Provided and allowed by the controls.
3. Except for gas-fired steam boilers for which minimum AFUE is 75%.
4. E_c = combustion efficiency, 100% - flue losses. See reference document for detailed information.

TABLE 14-4

Energy Efficient Electric Motors
Minimum Nominal Full-Load Efficiency

	Open Motors			Closed Motors		
Synchronous Speed (RPM)	3,600	1,800	1,200	3,600	1,800	1,200
HP	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency
1.0	-	82.5	80.0	75.5	82.5	80.0
1.5	82.5	84.0	84.0	82.5	84.0	85.5
2.0	84.0	84.0	85.5	84.0	84.0	86.5
3.0	84.0	86.5	86.5	85.5	87.5	87.5
5.0	85.5	87.5	87.5	87.5	87.5	87.5
7.5	87.5	88.5	88.5	88.5	89.5	89.5
10.0	88.5	89.5	90.2	89.5	89.5	89.5
15.0	89.5	91.0	90.2	90.2	91.0	90.2
20.0	90.2	91.0	91.0	90.2	91.0	90.2
25.0	91.0	91.7	91.7	91.0	92.4	91.7
30.0	91.0	92.4	92.4	91.0	92.4	91.7
40.0	91.7	93.0	93.0	91.7	93.0	93.0
50.0	92.4	93.0	93.0	92.4	93.0	93.0
60.0	93.0	93.6	93.6	93.0	93.6	93.6
75.0	93.0	94.1	93.6	93.0	94.1	93.6
100.0	93.0	94.1	94.1	93.6	94.5	94.1
125.0	93.6	94.5	94.1	94.5	94.5	94.1
150.0	93.6	95.0	94.5	94.5	95.0	95.0
200.0	94.5	95.0	94.5	95.0	95.0	95.0

TABLE 14-5
Duct Insulation

Duct Location	Insulation R-Value
Not within conditioned space: On exterior of building, on roof, in attic, in enclosed ceiling space, in walls, in garage, in crawl spaces	R-7[1]
Not within conditioned space: in concrete, in ground	R-5.3
Supply air ducts within conditioned space with HVAC equipment supply air temperature <55 or $>105^{o}$ F	R-3.3

Note: Requirements apply to both supply and return ducts, whether heated or mechanically cooled. Mechanically cooled ducts requiring insulation shall have a vapor retarder, with a perm rating not greater than 0.5 and all joints sealed.

1. With approved weatherproof barrier.

INSULATION TYPES: Minimum densities and out of package thickness. Nominal R-values are for the insulation as installed and do not include air film resistance.

INSTALLED:

R-3.3 1.0 inch 1.5 to 3 lb/cu.ft. duct liner, mineral or glass fiber blanket or equivalent to provide an installed total thermal resistance of at least R-3.3.

R-5.3 2.0 inch 0.75 lb/cu.ft.mineral or glass fiber blanket, 1.5 inch 1.5 to 3 lb/cu.ft. duct liner, mineral or glass fiber blanket, 1.5 inch 3 to 7 lb/cu.ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-5.3.

R-7 3-inch 0.75 lb/cu./ft. mineral or glass fiber blanket, 2-inch 1.5 to 3 lb/cu.ft. duct liner, mineral or glass fiber blanket, 2-inch 3 to 7 lb/cu.ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-7.

TABLE 14-6
Minimum Pipe Insulation (inches)[1]

Fluid Design Operating Temp. Range, ^{O}F	Insulation Conductivity		Nominal Pipe Diameter (in.)					
	Conductivity Range Btu • in./(h • ft^2 • °F)	Mean Rating Temp. ^{O}F	Runouts[2] up to 2	1 and less	> 1 to 2	> 2 to 4	> 4 to 6	> 6
Heating systems (Steam, Steam Condensate, and Hot water)			Nominal Insulation Thickness					
Above 350	0.32-0.34	250	1.5	2.5	2.5	3.0	3.5	3.5
251-350	0.29-0.31	200	1.5	2.0	2.5	2.5	3.5	3.5
201-250	0.27-0.30	150	1.0	1.5	1.5	2.0	2.0	3.5
141-200	0.25-0.29	125	0.5	1.5	1.5	1.5	1.5	1.5
105-140	0.24-0.28	100	0.5	1.0	1.0	1.0	1.5	1.5
Domestic and Service Hot Water Systems								
105 and Greater	0.24-0.28	100	0.5	1.0	1.0	1.5	1.5	1.5
Cooling Systems (Chilled Water, Brine, and Refrigerant)								
40-55	0.23-0.27	75	0.5	0.5	0.75	1.0	1.0	1.0
Below 40	0.23-0.27	75	1.0	1.0	1.5	1.5	1.5	1.5

1. Alternative Insulation Types. Insulation thicknesses in Table 14-6 are based on insulation with thermal conductivities within the range listed in Table 14-6 for each fluid operating temperature range, rated in accordance with ASTM C 335-84 at the mean temperature listed in the table. For insulation that has a conductivity outside the range shown in Table 14-6 for the applicable fluid operating temperature range at the mean rating temperature shown (when rounded to the nearest 0.01 Btu • in./(h • ft^2 • °F)), the minimum thickness shall be determined in accordance with the following equation:

$$T = PR[1 + t/PR)^{K/k} - 1]$$

Where

T = Minimum insulation thickness for material with conductivity K, inches.
PR = Pipe actual outside radius, inches.
t = Insulation thickness from Table 14-6, inches
K = conductivity of alternate material at the mean rating temperature indicated in Table 14-6 for the applicable fluid temperature range, Btu • in./(h • ft^2 • °F)
k = the lower value of the conductivity range listed in Table 14-6 for the applicable fluid temperature range, Btu • in./(h • ft^2 • °F)

2. Runouts to individual terminal units not exceeding 12 ft. in length.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1454, filed 10/18/93, effective 4/1/94.]

CHAPTER 15
LIGHTING AND MOTORS

WAC 51-11-1501 Scope. Interior and exterior lighting and electric motors shall comply with the requirements of this chapter.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1501, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1510 General requirements. Lighting and motors shall comply with Sections 1511 through 1513. Lighting systems shall comply with one of the following paths:

a.Prescriptive Standards:
Interior Section 1521, or
Exterior Section 1522.
b.Component Performance:
Interior Section 1531, or
Exterior Section 1532.
c.Systems Analysis. See Section 1141.4.

The compliance path selected for interior and exterior lighting need not be the same. However, interior and exterior lighting cannot be traded.

Figure 15A

Lighting and Motor Compliance Options

Section Number	Subject	Prescriptive Option	Lighting Power Allowance Option	Systems Analysis Option
1510	General Requirements	X	X	X
1511	Electric Motors	X	X	X
1512	Exempt Lighting	X	X	X
1513	Lighting Controls	X	X	X
1520	Prescriptive Lighting Option	X		
1521	Prescriptive Interior Lighting Requirements	X		
1522	Prescriptive Exterior Lighting Requirements	Sec. 1532		
1530	Lighting Power Allowance Option		X	
1531	Interior Lighting Power Allowance		X	
1532	Exterior Lighting Power Allowance		X	
RS-29	Systems Analysis			X

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1510, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1511 Electric motors. All permanently wired polyphase motors of 1 hp or more, which are not part of an HVAC system, shall comply with Section 1437.

EXCEPTIONS:
1. Motors that are an integral part of specialized process equipment.
2. Where the motor is integral to a listed piece of equipment for which no complying motor has been approved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1511, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1512 Exempt lighting.

1512.1 Exempt Spaces: The following rooms, spaces, and areas, are exempt from the lighting power requirements in Sections 1520 and 1530 but shall comply with all other requirements of this chapter.

1. Areas in which medical or dental tasks are performed.
2. High risk security areas or any area identified by safety officials as requiring additional lighting.
3. Spaces designed for primary use by the visually impaired, hard of hearing (lip-reading) or by senior citizens.
4. Food preparation areas.
5. Outdoor manufacturing, greenhouses, and processing areas.
6. Electrical/mechanical equipment rooms.
7. Outdoor athletic facilities.
8. Inspection and restoration areas in galleries and museums.

1512.2 Exempt Lighting Equipment: The following lighting equipment and tasks are exempt from the lighting requirements of Section 1520 and need not be included when calculating the installed lighting power under Section 1530 but shall comply with all other requirements of this chapter. All other lighting in areas that are not exempted by Section 1512.2, where exempt tasks and equipment are used, shall comply with all of the requirements of this chapter.

1. Special lighting needs for research.
2. Emergency lighting that is automatically OFF during normal building operation.

3. Lighting for signs, and ballasted lighting for walkways and pathways.
4. Lighting that is part of machines, equipment or furniture.
5. Lighting that is used solely for indoor plant growth during the hours of 10:00 p.m. to 6:00 a.m.
6. Lighting for theatrical productions, television broadcasting (including sports facilities), audio-visual presentations, and special effects lighting for stage areas and dance floors in entertainment facilities.
7. Lighting for art exhibits, nonretail displays, portable plug in display fixtures, and show case lighting.
8. Exterior lighting for public monuments.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1512, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1513 Lighting controls.

1513.1 Local Control and Accessibility: Each space, enclosed by walls or ceiling-height partitions, shall be provided with lighting controls located within that space. The lighting controls, whether one or more, shall be capable of turning off all lights within the space. The controls shall be readily accessible, at the point of entry/exit, to personnel occupying or using the space.

EXCEPTIONS: The following lighting controls may be centralized in remote locations:
1. Lighting controls for spaces which must be used as a whole.
2. Automatic controls.
3. Controls requiring trained operators.
4. Controls for safety hazards and security.

1513.2 Area Controls: The maximum lighting power that may be controlled from a single switch or automatic control shall not exceed that which is provided by a twenty ampere circuit loaded to not more than eighty percent. A master control may be installed provided the individual switches retain their capability to function independently. Circuit breakers may not be used as the sole means of switching.

EXCEPTIONS:
1. Industrial or manufacturing process areas, as may be required for production.
2. Areas less than five percent of footprint for footprints over 100,000 square feet.

1513.3 Daylight Zone Control: All daylighted zones, as defined in Chapter 12, both under overhead glazing and adjacent to vertical glazing, shall be provided with individual controls, or daylight- or occupant-sensing automatic controls, which control the lights independent of general area lighting.

1513.4 Display, Exhibition, and Specialty Lighting Controls: All display, exhibition, or specialty lighting shall be controlled independently of general area lighting.

1513.5 Automatic Shut-Off Controls, Exterior: Exterior lighting not intended for 24-hour continuous use shall be automatically switched by timer, photocell, or a combination of timer and photocell. Automatic time switches must also have program back-up capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.

1513.6 Automatic Shut-Off Controls, Interior: Office buildings greater than 25,000 sq. ft. and all school classrooms shall be equipped with separate automatic controls to shut off the lighting during unoccupied hours. Automatic controls may be an occupancy sensor, time switch, or other device capable of automatically shutting off lighting.

EXCEPTIONS:
1. Areas that must be continuously illuminated, or illuminated in a manner requiring manual operation of the lighting.
2. Emergency lighting systems.
3. Switching for industrial or manufacturing process facilities as may be required for production.

1513.6.1 Occupancy Sensors: Occupancy sensors shall be capable of automatically turning off all the lights in an area, no more than 30 minutes after the area has been vacated.

1513.6.2 Automatic Time Switches: Automatic time switches shall have a minimum 7 day clock and be capable of being set for 7 different day types per week and incorporate an automatic holiday "shut-off" feature, which turns off all loads for at least 24 hours and then resumes normally scheduled operations. Automatic time switches shall also have program back-up capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.

Automatic time switches shall incorporate an over-ride switching device which:

a. is readily accessible;
b. is located so that a person using the device can see the lights or the areas controlled by the switch, or so that the area being illuminated is annunciated; and
c. is manually operated;
d. allows the lighting to remain on for no more than two hours when an over-ride is initiated; and
e. controls an area not exceeding 5,000 square feet or 5 percent of footprint for footprints over 100,000 square feet, whichever is greater.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1513, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1520 Prescriptive lighting option.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1520, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1521 Prescriptive interior lighting requirements. Spaces for which the Unit Lighting Power Allowance in Table 15-1 is 0.8 watts per square foot or greater may use unlimited numbers of lighting fixtures and lighting energy, provided that the installed lighting fixtures are one- or two-lamp (but not three- or more lamp) non-lensed, fluorescent fixtures fitted with type T-5, T-6, T-8 or PL type lamps from 5 to 50 watts and electronic ballasts.

EXCEPTION: Up to a total of 5 percent of installed lighting fixtures need not be ballasted and may use any type of lamp.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1521, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1522 Prescriptive exterior lighting requirements. See section 1532.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1522, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1530 Component performance lighting option. The installed lighting wattage shall not exceed the lighting power allowance. Lighting wattage includes lamp and ballast wattage. Wattage for fluorescent lamps and ballasts shall be tested per ANSI Standard C82.2-1984.

The wattage used for any unballasted fixture shall be the maximum UL listed wattage for that fixture regardless of the lamp installed. The wattage used for track lighting shall be the maximum of actual luminaire wattage or 50 watts per lineal foot of track.

No credit towards compliance with the lighting power allowances shall be given for the use of any controls, automatic or otherwise.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1530, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1531 Interior lighting power allowance. The interior lighting power allowance shall be calculated by multiplying the gross interior floor area, in square feet, by the appropriate unit lighting power allowance, in watts per square foot, for the use as specified in Table 15-1. Accessory uses, including corridors, lobbies and toilet facilities shall be included with the primary use.

If multiple uses are intended, the lighting power allowance for each type of use shall be separately calculated and summed to obtain the interior lighting power allowance.

In cases where a lighting plan for only a portion of a building is submitted, the interior lighting power allowance shall be based on the gross floor area covered by the plan. Plans submitted for common areas only, including corridors, lobbies and toilet facilities shall use the lighting power allowance for common areas in Table 15-1.

When insufficient information is known about the specific use of the space, the allowance shall be based on the apparent intended use of the space.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1531, filed 10/18/93, effective 4/1/94.]

WAC 51-11-1532 Exterior lighting power allowance. The exterior lighting power allowance shall be the sum of the calculated allowances for parking, outdoor areas and building exteriors. The lighting allowance for covered parking, open parking and outdoor areas shall be 0.20 watts per square foot. The lighting allowance for building exteriors shall be calculated either by multiplying the building facade area by 0.25 watts per square foot or multiplying the building perimeter in feet by 7.5 watts per linear foot.

EXCEPTION: Group M occupancy accessory to Group R occupancy.

TABLE 15-1

Unit Lighting Power Allowance (LPA)

Use[1]	LPA[2] (watts/sq. ft.)
Painting, welding, carpentry, machine shops	2.3
Barber shops, beauty shops	2.0
Hotel banquet/conference/exhibition hall[3,4]	2.0
Laboratories	2.0
Aircraft repair hangars	1.5
Cafeterias, fast food establishments[5]	1.5
Factories, workshops, handling areas	1.5
Gas stations, auto repair shops[6]	1.5
Institutions	1.5
Libraries[5]	1.5
Nursing homes	1.5
Wholesale stores (pallet rack shelving)	1.5
Mall concourses	1.4
Schools buildings, school classrooms, day care centers	1.35
Laundries	1.3
Office buildings, office/administrative areas in facilities of other use types (including but not limited to schools, hospitals, institutions, museums, banks, churches)[5,7,11]	1.2
Police and fire stations[8]	1.2
Atria (atriums)	1.0
Assembly spaces[9], auditoriums, gymnasia[9], theaters	1.0
Process plants	1.0
Restaurants/bars[5]	1.0
Retail A[10]	1.0
Retail B[10], Retail banking	1.5
Locker and/or shower facilities	0.8
Warehouses[11], storage areas	0.5
Aircraft storage hangars	0.4
Parking garages	See Section 1532
Plans Submitted for Common Areas Only[7]	
Common area, corridors, lobbies (except mall concourse)	0.8
Toilet facilities and washrooms	0.8

Footnotes for Table 15-1

1. In cases in which a use is not mentioned specifically, the *Unit Power Allowance* shall be determined by the building official. This determination shall be based upon the most comparable use specified in the table. See Section 1512 for exempt areas.

2. The watts per square foot may be increased, by two percent per foot of ceiling height above twenty feet, unless specifically directed otherwise by subsequent footnotes.

3. Watts per square foot of room may be increased by two percent per foot of ceiling height above twelve feet.

4. For all other spaces, such as seating and common areas, use the *Unit Light Power Allowance* for assembly.

5. Watts per square foot of room may be increased by two percent per foot of ceiling height above nine feet.

6. Includes pump area under canopy.

7. In cases in which a lighting plan is submitted for only a portion of a floor, a *Unit Lighting Power Allowance* of 1.35 may be used for usable office floor area and 0.80 watts per square foot shall be used for the common areas, which may include elevator space, lobby area and rest rooms. Common areas, as herein defined do not include mall concourses.

8. For the fire engine room, the *Unit Lighting Power Allowance* is 1.0 watts per square foot.

9. For indoor sport tournament courts with adjacent spectator seating, the *Unit Lighting Power Allowance* for the court area is 2.6 watts per square foot.

10. For both *Retail A* and *Retail B*, light for free-standing display, building showcase illumination and display window illumination installed within two feet of the window are exempt.

    Retail A allows a *Unit Lighting Power Allowance* of 1.0 watts per square foot. Ceiling mounted adjustable tungsten halogen and HID merchandise display illuminaries are exempt.

    Retail B allows a *Unit Lighting Power Allowance* of 1.5 watts per square foot, including all ceiling mounted merchandise display luminaries.

11. Provided that a floor plan, indicating rack location and height, is submitted, the square footage for a warehouse may be defined, for computing the interior *Unit Lighting Power Allowance,* as the floor area not covered by racks plus the vertical face area (access side only) of the racks. The height allowance defined in footnote 2 applies only to the floor area not covered by racks.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1532, filed 10/18/93, effective 4/1/94.]

CHAPTER 16
(RESERVED)

CHAPTER 17
STANDARDS

WAC 51-11-1701 Scope. The following standards will apply to Chapters 11 through 20.

The standards and portions thereof, which are referred to in various parts of this Code shall be part of the Washington State Energy Code and are hereby declared to be a part of this Code.

CODE STANDARD NO.	TITLE AND SOURCE
RS-1	through RS-8 **(Reserved)**
RS-9	ASHRAE/IES Standard 90.1-1989, Efficient Design of Buildings Except New Low-Rise Residential Buildings.
RS-10	through RS-17 **(Reserved)**
RS-18	SMACNA Duct Metal and Flexible Construction Standards, 1st Edition.
RS-19	through RS-24 **(Reserved)**
RS-25	Thermal Bridges in Sheet Metal Construction from Appendix E of RS-9.
RS-26	Super Good Cents Technical Reference.
RS-27	1993 ASHRAE Fundamentals Handbook.
RS-28	1992 ASHRAE HVAC Systems and Equipment Handbook.
RS-29	Commercial Building Design by Systems Analysis.
RS-30	Title 10, Code of Federal Regulations (CFR), Part 430 (March 14, 1988).
RS-31	National Fenestration Rating Council (NFRC) Standard 100-91.

ACCREDITED AUTHORITATIVE AGENCIES

ANSI refers to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018

ARI refers to the Air Conditioning and Refrigeration Institute, 4301 North Fairfax Drive, Suite 425, Arlington, VA 22203

ASHRAE refers to the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329

ASTM refers to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

CTI refers to the Cooling Tower Institute, P.O. Box 73383 Houston TX 77273

NFRC refers to National Fenestration Rating Council, 1300 Spring Street, Suite 120, Silver Spring, MD 20910

SMACNA refers to the Sheet Metal and Air Conditioning Contractors National Association, Inc., 4201 Lafayette Center Drive, Chantilly, VA 22021-1209.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-1701, filed 10/18/93, effective 4/1/94.]

CHAPTER 18
(RESERVED)

CHAPTER 19
(RESERVED)

CHAPTER 20
DEFAULT HEAT-LOSS COEFFICIENTS

WAC 51-11-2000 Default heat-loss coefficients. (Reserved.)

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2000, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2001 General.

2001.1 Scope: The following defaults will apply to Chapters 11 through 20. This chapter includes tables of seasonal average heat-loss coefficients for specified nominal insulation. The heat-loss coefficients may also be used for heating system sizing.

2001.2 Description: These coefficients were developed primarily from data and procedures from Standard RS-27, and taken specifically from Standard RS-26, listed in Chapter 17.

Coefficients not contained in this chapter may be computed using the procedures listed in these references if the assumptions in the following sections and Standard RS-26, listed in Chapter 17, are used, along with data from the sources referenced above.

2001.3 Air Films: Default R-values used for air films shall be as follows:

R-Value	Condition
0.17	All exterior surfaces
0.61	Interior horizontal surfaces, heat flow up
0.72	Interior horizontal surfaces, heat flow down
0.68	Interior vertical surfaces

2001.4 Compression of Insulation: Insulation which is compressed shall be rated in accordance with Table 20-A or reduction in value may be calculated in accordance with the procedures in Standard RS-27 listed in Chapter 17.

TABLE 20-A

R-value of Fiberglass Batts Compressed
within Various Depth Cavities

Insulation R-Value at Standard Thickness												
R-Value		38	30	22	21	19	15	13	11	8	5	3
Standard Thickness		12"	9-1/2"	6-3/4"	5-1/2"	6-1/4"	3-1/2"	3-5/8"	3-1/2"	2-1/2"	1-1/2"	3/4"
Nominal Lumber Sizes	Actual Depth of Cavity	Insulation R-Values when Installed in a Confined Cavity										
2" x 12"	11-1/4"	37	--	--	--	--	--	--	--	--	--	--
2" x 10"	9-1/4"	32	30	--	--	--	--	--	--	--	--	--
2" x 8"	7-1/4"	27	26	--	--	--	--	--	--	--	--	--
2" x 6"	5-1/2"	--	21	20	21	18	--	--	--	--	--	--
2" x 4"	3-1/2"	--	--	14	--	13	15	13	11	--	--	--
2" x 3"	2-1/2"	--	--	--	--	--	--	9.8	--	--	--	--
2" x 2"	1-1/2"	--	--	--	--	--	--	6.3	6.0	5.7	5.0	--
2" x 1"	3/4"	--	--	--	--	--	--	--	--	--	3.2	3.0

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2001, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2002 Below grade walls and slabs.

2002.1 General: Table 20-1 lists heat-loss coefficients for below-grade walls and floors.

Coefficients for below-grade walls are given as U-factors (Btu/h●ft²●°F of wall area). Coefficients for below-grade slabs are listed as F-factors (Btu/h●ft●°F per lineal foot of slab perimeter).

Below-grade wall U-factors are only valid when used with the accompanying below-grade slab F-factor, and vice versa.

2002.2 Component Description: All below-grade walls are assumed to be eight inch concrete. The wall is assumed to extend from the slab upward to the top of the mud sill for the distance specified in Table 20-1, with six inches of concrete wall extending above grade.

Interior insulation is assumed to be fiberglass batts placed in the cavity formed by 2x4 framing on twenty-four inch centers with one-half inch of gypsum board as the interior finish material. Exterior insulation is assumed to be applied directly to the exterior of the below-grade wall from the top of the wall to the footing. The exterior case does not assume any interior framing or sheetrock.

In all cases, the entire wall surface is assumed to be insulated to the indicated nominal level with the appropriate framing and insulation application. Coefficients are listed for wall depths of two, three and one-half, and seven feet below grade. Basements shallower than two feet should use on-grade slab coefficients.

Heat-loss calculations for wall areas above grade should use above-grade wall U-factors, beginning at the mudsill.

2002.3 Insulation Description: Coefficients are listed for the following four configurations:

1. Uninsulated: No insulation or interior finish.
2. Interior insulation: Interior 2x4 insulated wall without a thermal break between concrete wall and slab.
3. Interior insulation with thermal break: Interior 2x4 insulated wall with R-5 rigid board providing a thermal break between the concrete wall and the slab.
4. Exterior insulation: Insulation applied directly to the exterior surface of the concrete wall.

TABLE 20-1
Default Wall U-Factors and
Slab F-Factors for Basements

	Below Grade Wall U-factor	Below Grade Slab F-factor
2-Foot Depth Below Grade		
Uninsulated	0.350	0.59
R-11 Interior	0.066	0.68
R-11 Interior w/tb	0.070	0.60
R-19 Interior	0.043	0.69
R-19 Interior w/tb	0.045	0.61
R-10 Exterior	0.070	0.60
R-12 Exterior	0.061	0.60
3.5-Foot Depth Below Grade		
Uninsulated	0.278	0.53
R-11 Interior	0.062	0.63
R-11 Interior w/tb	0.064	0.57
R-19 Interior	0.041	0.64
R-19 Interior w/tb	0.042	0.57
R-10 Exterior	0.064	0.57
R-12 Exterior	0.057	0.57
7-Foot Depth Below Grade		
Uninsulated	0.193	0.46
R-11 Interior	0.054	0.56
R-11 Interior w/tb	0.056	0.42
R-19 Interior	0.037	0.57
R-19 Interior w/tb	0.038	0.43
R-10 Exterior	0.056	0.42
R-12 Exterior	0.050	0.42

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2002, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2003 On-grade slab floors.

2003.1 General: Table 20-2 lists heat-loss coefficients for unheated and heated on-grade slab floors, in units of Btu/h●°F per lineal foot of perimeter.

2003.2 Component Description: All on-grade slab floors are assumed to be six inch concrete poured directly onto the earth. The bottom of the slab is assumed to be at grade line. Monolithic and floating slabs are not differentiated.

Soil is assumed to have a conductivity of 0.75 Btu/h●ft²●°F. Slabs two feet or more below grade should use basement coefficients.

2003.3 Insulation Description: Coefficients are provided for the following three configurations:

Two Foot (or Four Foot) vertical: Insulation is applied directly to the slab exterior, extending downward from the top of the slab to a depth of two feet (or four feet) below grade.

Two Foot (or Four Foot) horizontal: Insulation is applied directly to the underside of the slab, and run horizontally from the perimeter inward for two feet (or four feet). The slab edge is exposed in this configuration.

Fully insulated slab: Insulation extends from the top of the slab, along the entire perimeter, and completely covers the area under the slab. Thicker perimeter insulation covers the slab edge and extends two feet under the slab.

TABLE 20-2
Default F-Factors for On-Grade Slabs

Insulation type	R-0	R-5	R-10	R-15
Unheated Slab				
Uninsulated slab	0.73	--	--	--
2-ft Horizontal (No thermal break)	--	0.70	0.70	0.69
4-ft Horizontal (No thermal break)	--	0.67	0.64	0.63
2-ft Vertical	--	0.58	0.54	0.52
4-ft vertical	--	0.54	0.48	0.45
Fully insulated slab	--	--	0.36	--
Heated Slab				
Uninsulated slab	0.84	--	--	--
Fully insulated slab	--	0.74	0.55	0.44
R-5 Center (With perimeter insulation)	--	--	0.66	0.62
R-10 Center (With perimeter insulation)	--	--	--	0.51
3-ft Vertical	--	--	0.78	--

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2003, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2004 Floors over unconditioned space.

2004.1 General: Tables 20-3, 20-4 and 20-4a list heat loss coefficients for floors over unconditioned spaces in units of Btu/h●ft²●°F.

They are derived from procedures listed in Standard RS-27, listed in Chapter 17, assuming an average outdoor temperature of 45 degrees F, an average indoor temperature of 65 degrees F, and a crawl space area of 1350 ft² and one hundred feet of perimeter. The crawl space is assumed to be two and one-half feet high, with twenty-four inches below grade and six inches above grade.

2004.2 Category Description: Four configurations are considered: vented crawl space, unvented crawl space, heated plenum crawl space and exposed floor.

Vented crawl spaces: Assumed to have three air-changes per hour, with at least one ft² of net-free ventilation in the foundation for every three hundred ft² of crawl space floor area. The crawl space is not actively heated.

Floors over unheated areas, such as garages, may only use those values which have R-0 perimeter insulation.

Unvented crawl spaces: Assumed to have 1.5 air changes per hour, with less than one ft² of net-free ventilation in the foundation for every three hundred ft² of crawl space floor area. The crawl space is not actively heated. Floors over unheated basements may only use those values which have R-0 perimeter insulation.

Heated-plenum crawl spaces: Assumed to have 0.25 air-changes per hour, with no foundation vents. Heated supply air from central furnace is blown into a crawl space and allowed to enter the living space unducted via holes cut into the floor.

Exposed floors: Assumes no buffer space, and a covering of one-half inch of T1-11 on the exterior of the cavity exposed to the outside air or rigid insulation below a concrete floor, such as over parking garages.

2004.3 Construction Description: Floors are assumed to be either joisted floors framed on sixteen inch centers, or post and beam on four by eight foot squares. Insulation is assumed to be installed under the subflooring between the joists or beams with no space between the insulation and the subfloor. Insulation is assumed to be uncompressed. Exposed floors also include concrete with continuous rigid insulation assumed.

Perimeter insulation is assumed to extend from the top of the rim joist to the crawl space floor and then inward along the ground (on top of the ground cover) for at least twenty-four inches.

Floor coverings are assumed to be light carpet with rubber pad.

TABLE 20-3
Default U-Factors for Floors
Over Crawlspace or Unheated Basement

Nominal R-value		U-Factor	
Floor	Perimeter	Post & Beam	Joists
0	0	0.112	0.134
	11	0.100	0.116
	19	0.098	0.114
	30	0.093	0.107
11	0	0.052	0.056
	11	0.048	0.052
19	0	0.038	0.041
	11	0.036	0.038
22	0	0.034	0.037
	11	0.033	0.035
25	0	0.032	0.034
	11	0.031	0.033
30	0	0.028	0.029
	11	0.027	0.028
38	0	0.024	0.025
	11	0.024	0.024

TABLE 20-4
Default U-factors for Floors Over
Heated Plenum Crawlspace

Nominal R-valuePerimeter	U-factor
11	0.085
19	0.075
30	0.069

TABLE 20-4a
Exposed Floors

Nominal R-value	U-factor		
	Concrete	Wood Joist	Metal Joist
R-11	0.077	0.088	0.14
R-15	0.059	0.076	0.12
R-19	0.048	0.062	0.11
R-21	0.043	0.057	0.11
R-25	0.037	0.051	0.10
R-30	0.031	0.040	0.09
R-38	0.025	0.034	0.08

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2004, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2005 Above grade walls.

2005.1 General: Table 20-5, 20-5a and 20-5b list heat-loss coefficients for the opaque portion of above-grade wood stud frame walls, metal stud frame walls and concrete masonry walls (Btu/h●ft²●°F). They are derived from procedures listed in Standard RS-27, listed in Chapter 17.

2005.2 Framing Description: For wood stud frame walls, three framing types are considered, and defined as follows:

Standard: Studs framed on sixteen inch centers with double top plate and single bottom plate. Corners use three studs and each opening is framed using two studs. Headers consist of double 2X or single 4X material with an air space left between the header and the exterior sheathing. Interior partition wall/exterior wall intersections use two studs in the exterior wall.

Standard framing weighting factors:

Studs and plates	0.19
Insulated cavity	0.77
Headers	0.04

Intermediate: Studs framed on sixteen inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and each opening is framed by two studs. Headers consist of double 2X material with R-10 insulation between the header and exterior sheathing. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall.

Intermediate framing weighting factors:

Studs and plates	0.18
Insulated cavity	0.78
Headers	0.04

Advanced: Studs framed on twenty-four inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and one stud is used to support each header. Headers consist of double 2X material with R-10 insulation between the header and exterior sheathing. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall.

Advanced Framing Weighting Factors:

Studs and plates	0.13
Insulated cavity	0.83
Headers	0.04

2005.3 Component Description: For wood stud frame walls, default coefficients for three types of walls are listed: Single-stud walls, strap walls, and double-stud walls.

Single-Stud Wall: Assumes either 2x4 or 2x6 studs framed on sixteen or twenty-four inch centers. Headers are solid for 2x4 walls and double 2x for 2x6 walls, with either dead-air or rigid-board insulation in the remaining space.

Strap Wall: Assumes 2x6 studs framed on sixteen or twenty-four inch centers. 2x3 or 2x4 strapping is run horizontally along the interior surface of the wall to provide additional space for insulation.

Double-Stud Wall: Assumes an exterior structural wall and a separate interior, nonstructural wall. Insulation is placed in both wall cavities and in the space between the two walls. Stud spacing is assumed to be on twenty-four inch centers for both walls.

TABLE 20-5
Default U-factors for Above-Grade Walls

2 x 4 Single Wood Stud: R-11 Batt

NOTE:
Nominal Batt R-value:
R-11 at 3.5-inch thickness

Installed Batt R-value:
R-11 in 3.5-inch cavity

Siding Material/Framing Type				
	Lapped Wood		T1-11	
R-value of foam Board	STD	ADV	STD	ADV
0	.088	.084	.094	.090
1	.080	.077	.085	.082
2	.074	.071	.078	.075
3	.069	.066	.072	.070
4	.064	.062	.067	.065
5	.060	.058	.063	.061
6	.056	.055	.059	.057
7	.053	.052	.055	.054
8	.051	.049	.052	.051
9	.048	.047	.050	.049
10	.046	.045	.047	.046
11	.044	.043	.045	.044
12	.042	.041	.043	.042

2 x 4 Single Wood Stud: R-13 Batt

NOTE:
Nominal Batt R-value:
R-13 at 3.63-inch thickness

Installed Batt R-value:
R-12.7 in 3.5-inch cavity

Siding Material/Framing Type				
	Lapped Wood		T1-11	
R-value of foam Board	STD	ADV	STD	ADV
0	.082	.078	.088	.083
1	.075	.072	.080	.076
2	.069	.066	.073	.070
3	.065	.062	.068	.065
4	.060	.058	.063	.061
5	.057	.055	.059	.057
6	.053	.052	.056	.054
7	.051	.049	.052	.051
8	.048	.047	.050	.048
9	.046	.045	.047	.046
10	.044	.043	.045	.044
11	.042	.041	.043	.042
12	.040	.039	.041	.040

2 x 4 Single Wood Stud: R-15 Batt

NOTE:
Nominal Batt R-value:
R-15 at 3.5-inch thickness

Installed Batt R-value:
R-15 in 3.5-inch cavity

Siding Material/Framing Type				
	Lapped Wood		T1-11	
R-value of foam Board	STD	ADV	STD	ADV
0	.076	.071	.081	.075
1	.069	.065	.073	.069
2	.064	.061	.068	.069
3	.060	.057	.063	.059
4	.056	.053	.059	.056
5	.053	.051	.055	.052
6	.050	.048	.052	.050
7	.047	.046	.049	.047
8	.045	.044	.047	.045
9	.043	.042	.044	.043
10	.041	.040	.042	.041
11	.039	.038	.041	.039
12	.038	.037	.039	.038

2 x 6 Single Wood Stud: R-19 Batt

NOTE:
Nominal Batt R-value:
R-19 at 6-inch thickness

Installed Batt R-value:
R-18 in 5.5-inch cavity

Siding Material/Framing Type						
	Lapped Wood			T1-11		
R-value of foam Board	STD	INT	ADV	STD	INT	ADV
0	.062	.058	.055	.065	.061	.058
1	.058	.055	.052	.060	.057	.055
2	.054	.052	.050	.056	.054	.051
3	.051	.049	.047	.053	.051	.049
4	.048	.046	.045	.050	.048	.046
5	.046	.044	.043	.048	.046	.044
6	.044	.042	.041	.045	.044	.042
7	.042	.040	.039	.043	.042	.040
8	.040	.039	.038	.041	.040	.039
9	.038	.037	.035	.039	.038	.037
10	.037	.036	.035	.038	.037	.036
11	.036	.035	.034	.036	.035	.035
12	.034	.033	.033	.035	.034	.033

2 x 6 Single Wood Stud: R-21 Batt

NOTE:
Nominal Batt R-value:
R-21 at 5.5-inch thickness

Installed Batt R-value:
R-21 in 5.5-inch cavity

Siding Material/Framing Type						
	Lapped Wood			T1-11		
R-value of foam Board	STD	INT	ADV	STD	INT	ADV
0	.057	.054	.051	.060	.056	.053
1	.054	.051	.048	.056	.053	.050
2	.050	.048	.045	.052	.050	.047
3	.048	.045	.043	.049	.047	.045
4	.045	.043	.041	.047	.045	.043
5	.043	.041	.040	.044	.042	.041
6	.041	.039	.038	.042	.041	.039
7	.039	.038	.036	.040	.039	.037
8	.038	.036	.035	.039	.037	.036
9	.036	.035	.034	.037	.036	.035
10	.035	.034	.033	.036	.035	.033
11	.033	.033	.032	.034	.033	.032
12	.032	.031	.031	.033	.032	.031

2 x 6 Single Wood Stud: R-22 Batt

NOTE:
Nominal Batt R-value:
R-22 at 6.75-inch thickness

Installed Batt R-value:
R-22 in 5.5-inch cavity

Siding Material/Framing Type						
	Lapped Wood			T1-11		
R-value of foam Board	STD	INT	ADV	STD	INT	ADV
0	.059	.055	.052	.062	.058	.054
1	.055	.052	.049	.057	.054	.051
2	.052	.049	.047	.054	.051	.048
3	.049	.046	.044	.050	.048	.046
4	.046	.044	.042	.048	.046	.044
5	.044	.042	.041	.045	.043	.042
6	.042	.040	.039	.043	.042	.040
7	.040	.039	.037	.041	.040	.038
8	.038	.037	.036	.039	.038	.037
9	.037	.036	.035	.038	.037	.035
10	.035	.034	.033	.036	.035	.034
11	.034	.033	.032	.035	.034	.033
12	.033	.032	.031	.034	.033	.032

2 x 6 Single Wood Stud: R-11 Batt

NOTE:
Nominal Batt R-value:
R-22 at 7-inch thickness

Installed Batt R-value:
R-18.9 in 5.5-inch cavity

Siding Material/Framing Type						
	Lapped Wood			T1-11		
R-value of foam Board	STD	INT	ADV	STD	INT	ADV
0	.060	.057	.054	.063	.059	.056
1	.056	.053	.051	.059	.056	.053
2	.053	.050	.048	.055	.052	.050
3	.050	.048	.046	.052	.049	.047
4	.047	.045	.044	.049	.047	.045
5	.045	.043	.042	.046	.045	.043
6	.043	.041	.040	.044	.043	.041
7	.041	.040	.038	.042	.041	.039
8	.039	.038	.037	.040	.039	.038
9	.038	.037	.036	.039	.038	.036
10	.036	.035	.034	.037	.036	.035
11	.035	.034	.033	.036	.035	.034
12	.034	.033	.032	.034	.034	.033

2 x 8 Single Stud: R-25 Batt

NOTE:
Nominal Batt R-value:
R-25 at 8-inch thickness

Installed Batt R-value:
R-23.6 in 7.25-inch cavity

Siding Material/Framing Type						
	Lapped Wood			T1-11		
R-value of foam Board	STD	INT	ADV	STD	INT	ADV
0	.051	.047	.045	.053	.049	.046
1	.048	.045	.043	.049	.046	.044
2	.045	.043	.041	.047	.044	.042
3	.043	.041	.039	.044	.042	.040
4	.041	.039	.037	.042	.040	.038
5	.039	.037	.036	.040	.038	.037
6	.037	.036	.035	.038	.037	.036
7	.036	.035	.033	.037	.035	.034
8	.035	.033	.032	.035	.034	.033
9	.033	.032	.031	.034	.033	.032
10	.032	.031	.030	.033	.032	.031
11	.031	.030	.029	.032	.031	.030
12	.030	.029	.028	.031	.030	.029

2 x 6: Strap Wall

	Siding Material/Frame Type			
	Lapped Wood		T1-11	
	STD	ADV	STD	ADV
R-19 + R-11 Batts	.036	.035	.038	.036
R-19 + R-8 Batts	.041	.039	.042	.040

2 x 6 + 2 x 4: Double Wood Stud

Batt Configuration			Siding Material/Frame Type			
			Lapped Wood		T1-11	
			STD	ADV	STD	ADV
Exterior	Middle	Interior				
R-19	------	R-11	.040	.037	.041	.038
R-19	------	R-19	.034	.031	.035	.032
R-19	R-8	R-11	.029	.028	.031	.029
R-19	R-11	R-11	.027	.026	.028	.027
R-19	R-11	R-19	.024	.023	.025	.023
R-19	R-19	R-19	.021	.020	.021	.020

2 x 4 + 2 x 4: Double Wood Stud

Batt Configuration			Sliding Material/Frame Type			
			Lapped Wood		T1-11	
Exterior	Middle	Interior	STD	ADV	STD	ADV
R-11	------	R-11	.050	.046	.052	.048
R-19	------	R-11	.039	.037	.043	.039
R-11	R-8	R-11	.037	.035	.036	.036
R-11	R-11	R-11	.032	.031	.033	.032
R-13	R-13	R-13	.029	.028	.029	.028
R-11	R-19	R-11	.026	.026	.027	.026

Log Walls

NOTE:
R-value of wood:
R-1.25 per inch thickness.
Average wall thickness
90% average log diameter

Average Log Diameter	U-factor
6-inch	0.148
8-inch	0.111
10-inch	0.089
12-inch	0.074
14-inch	0.063
16-inch	0.056

Stress Skin Panel

NOTE:
R-value of expanded:
polystyrene: R-3.85/inch

Framing: 6%:
Spline: 8%
No thermal bridging between interior and exterior splines

Panel Thickness	U-factor
3 1/2-inch	.071
5 1/2-inch	.048
7 1/4-inch	.037
9 1/4-inch	.030
11 1/4-inch	.025

Metal Stud Walls: The nominal R-values in Table 20-5a may be used for purposes of calculating metal stud wall section U-factors in lieu of the ASHRAE zone calculation method as provided in Chapter 22 of RS-27.

TABLE 20-5a

Default U-Factors and Effective R-Values for Metal Stud Walls

OVERALL ASSEMBLY U-FACTORS FOR METAL STUD WALLS

Nominal Wall Thickness	Nominal Insulation R-Value	Overall Assembly U-Factors	
		16" O.C.	24" O.C.
4 inch	R-11	0.14	0.13
4 inch	R-13	0.13	0.12
4 inch	R-15	0.12	0.11
6 inch	R-19	0.11	0.10
6 inch	R-21	0.11	0.09
8 inch	R-25	0.10	0.09

EFFECTIVE R-VALUES FOR METAL STUD AND INSULATED CAVITY ONLY

Cavity		Insulation		
			Effective R-value	
Nominal Depth	Actual Depth	Nominal R-Value	16" O.C.	24" O.C.
4 inch	3-1/2 "	R-11	5.5	6.6
4 inch	3-1/2"	R-13	6.0	7.2
4 inch	3-1/2"	R-15	6.4	7.8
6 inch	5-1/2"	R-19	7.1	8.6
6 inch	5-1/2"	R-21	7.4	9.0
8 inch	7-1/4"	R-25	7.8	9.6

Concrete Masonry Walls: The nominal R-values in Table 20-5b may be used for purposes of calculating concrete masonry wall section U-factors in lieu of the ASHRAE isothermal planes calculation method as provided in Chapter 22 of RS-27.

TABLE 20-5b

Default U-Factors for Concrete and Masonry Walls

8" CONCRETE MASONRY

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.40	0.23	0.24	0.43
R-5 Interior Insulation, Wood Furring	0.14	0.11	0.12	0.15
R-6 Interior Insulation, Wood Furring	0.14	0.11	0.11	0.14
R-10.5 Interior Insulation, Wood Furring	0.11	0.09	0.09	0.11
R-8 Interior Insulation, Metal Clips	0.11	0.09	0.09	0.11
R-6 Exterior Insulation	0.12	0.10	0.10	0.12
R-10 Exterior Insulation	0.08	0.07	0.07	0.08
Korfil Hi-R, Exposed Both Sides	0.11	0.09	0.09	0.12

12" CONCRETE MASONRY

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.35	0.17	0.18	0.33
R-5 Interior Insulation, Wood Furring	0.14	0.10	0.10	0.13
R-6 Interior Insulation, Wood Furring	0.13	0.09	0.10	0.13
R-10.5 Interior Insulation, Wood Furring	0.11	0.08	0.08	0.10
R-8 Interior Insulation, Metal Clips	0.10	0.08	0.08	0.09
R-6 Exterior Insulation	0.11	0.09	0.09	0.11
R-10 Exterior Insulation	0.08	0.06	0.06	0.08
Korfil Hi-R, Exposed Both Sides	0.11	0.08	0.09	0.12

8" CLAY BRICK

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.50	0.31	0.32	0.56
R-5 Interior Insulation, Wood Furring	0.15	0.13	0.13	0.16
R-6 Interior Insulation, Wood Furring	0.15	0.12	0.12	0.15
R-10.5 Interior Insulation, Wood Furring	0.12	0.10	0.10	0.12
R-8 Interior Insulation, Metal Clips	0.11	0.10	0.10	0.11
R-6 Exterior Insulation	0.12	0.11	0.11	0.13
R-10 Exterior Insulation	0.08	0.08	0.08	0.09

6" CONCRETE POURED OR PRECAST

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Concrete, Both Sides	NA	NA	NA	0.61
R-5 Interior Insulation, Wood Furring	NA	NA	NA	0.16
R-6 Interior Insulation, Wood Furring	NA	NA	NA	0.15
R-10.5 Interior Insulation, Wood Furring	NA	NA	NA	0.12
R-8 Interior Insulation, Metal Clips	NA	NA	NA	0.12
R-6 Exterior Insulation	NA	NA	NA	0.13
R-10 Exterior Insulation	NA	NA	NA	0.09

Notes for Default Table 20-5b

1. Grouted cores at 40" x 48" on center vertically and horizontally in partial grouted walls.
2. Interior insulation values include 1/2" gypsum board on the inner surface
3. Furring and stud spacing is 16" on center. Insulation is assumed to fill furring space and is not compressed.
4. Intermediate values may be interpolated using this table. Values not contained in this table may be computed using the procedures listed in RS-27.

Heat Capacity

	Partial Grout	Solid Grout
8" CMU	9.65	15.0
12" CMU	14.5	23.6
8" Brick	10.9	16.4
6" Concrete	NA	14.4

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2005, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2006 Default U-factors for glazing and doors.

2006.1 Untested Glazing and Doors: Untested glazing and doors shall be assigned the following U-factors:

TABLE 20-6
Default U-Factors for Vertical Glazing, Overhead Glazing and Opaque Doors

Vertical Glazing

	U-Factor
Single	1.45
Double	0.90
1/2 Inch Air, Fixed	0.75
1/2 Inch Air, Low-e(0.40), Fixed	0.60
1/2 Inch Argon, Low-e(0.10), Fixed	0.50

Overhead Glazing

	U-Factor	
	Any Frame	Vinyl/Wood Frame
Single	2.15	2.15
Double	1.45	1.00
Low-e(0.40) or Argon	1.40	0.95
Low-e(0.40) + Argon	1.30	0.85
Low-e(0.20) Air	1.30	0.90
Low-e(0.20) + Argon	1.25	0.80
Triple	1.25	0.80

Opaque Doors

	U-Factor
Uninsulated Metal	1.20
Insulated Metal (Including Fire Door and Smoke Vent)	0.60
Wood	0.50

NOTES:
Where a gap width is listed (i.e.: 1/2 inch), that is the minimum allowed.
Where a low-emissivity emittance is listed (i.e.: 0.40, 0.20, 0.10), that is the maximum allowed.
Where a gas other than air is listed (i.e.: argon), the gas fill shall be a minimum of 90%.
Where an operator type is listed (i.e.: fixed), the default is only allowed for that operator type.
Where a frame type is listed (i.e.: wood/vinyl), the default is only allowed for that frame type.
Wood/Vinyl frame includes reinforced vinyl and aluminum-clad wood.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2006, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2007 Ceilings.

2007.1 General: Table 20-7 lists heat-loss coefficients for the opaque portion of exterior ceilings below vented attics, vaulted ceilings, and roof decks in units of Btu/h●ft²●°F of ceiling.

They are derived from procedures listed in RS-27, listed in Chapter 17. Ceiling U-factors are modified for the buffering effect of the attic, assuming an indoor temperature of 65 degrees F and an outdoor temperature of 45 degrees F.

2007.2 Component Description: The three types of ceilings are characterized as follows:

Ceilings Below a Vented Attic: Attic insulation is assumed to be blown-in, loose-fill fiberglass with a K-value of 2.6 (h●ft²●°F)/Btu per inch. Full bag count for specified R-value is assumed in all cases. Ceiling dimensions for flat ceiling calculations are forty-five by thirty feet, with a gabled roof having a 4/12 pitch. The attic is assumed to vent naturally at the rate of three air changes per hour through soffit and ridge vents. A void fraction of 0.002 is assumed for all attics with insulation baffles. Standard-framed, unbaffled attics assume a void fraction of 0.008.

Attic framing is either standard or advanced. Standard framing assumes tapering of insulation depth around the perimeter with resultant decrease in thermal resistance. An increased R-value is assumed in the center of the ceiling due to the effect of piling leftover insulation. Advanced framing assumes full and even depth of insulation extending to the outside edge of exterior walls. Advanced framing does not change from the default value.

U-factors for flat ceilings below vented attics with standard framing may be modified with the following table:

	U-Factor for Standard Framing	
Roof Pitch	R-30	R-38
4/12	0.036	0.031
5/12	0.035	0.030
6/12	0.034	0.029
7/12	0.034	0.029
8/12	0.034	0.028
9/12	0.034	0.028
10/12	0.033	0.028
11/12	0.033	0.027
12/12	0.033	0.027

Vented scissors truss attics assume a ceiling pitch of 2/12 with a roof pitch of either 4/12 or 5/12. Unbaffled standard framed scissors truss attics are assumed to have a void fraction of 0.016.

Vaulted Ceilings: Insulation is assumed to be fiberglass batts installed in roof joist cavities. In the vented case, at least 1.5-inches between the top of the batts and the underside of the roof sheathing is left open for ventilation in each cavity. A ventilation rate of three air changes per hour is assumed. In the unvented or dense pack case, the ceiling cavity is assumed to be fully packed with insulation, leaving no space for ventilation.

Roof Decks: Rigid insulation is applied to the top of roof decking with no space left for ventilation. Roofing materials are attached directly on top of the insulation. Framing members are often left exposed on the interior side.

TABLE 20-7
Default U-factors for Ceilings

Ceilings Below Vented Attics	Standard Frame	Advanced Frame
Flat Ceiling	**Baffled**	
R-19	0.049	0.047
R-30	0.036	0.032
R-38	0.031	0.026
R-49	0.027	0.020
R-60	0.025	0.017
Scissors Truss		
R-30 (4/12 roof pitch)	0.043	0.031
R-38 (4/12 roof pitch)	0.040	0.025
R-49 (4/12 roof pitch)	0.038	0.020
R-30 (5/12 roof pitch)	0.039	0.032
R-38 (5/12 roof pitch)	0.035	0.026
R-49 (5/12 roof pitch)	0.032	0.020

Vaulted Ceilings	16" O.C.	24" O.C.
Vented		
R-19 2x10 joist	0.049	0.048
R-30 2x12 joist	0.034	0.033
R-38 2x14 joist	0.027	0.027
Unvented		
R-30 2x10 joist	0.034	0.033
R-38 2x12 joist	0.029	0.027
R-21 + R-21 2x12 joist	0.026	0.025

Roof Deck	U-factor
R-15 Rigid Insulation	0.063
R-21 Rigid Insulation	0.045
R-25 Rigid Insulation	0.038
R-30 Rigid Insulation	0.032
R-38 Rigid Insulation	0.025
R-50 Rigid Insulation	0.019

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2007, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2008 Reserved.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2008, filed 10/18/93, effective 4/1/94.]

WAC 51-11-2009 Mass.

2009.1 General: Table 20-10 lists default mass-values. All calculations are based on standard ASHRAE values for heat-storage capacity as listed in RS-27, Chapter 22.

Thermal capacity of furniture is ignored, as is heat storage beyond the first four inches of mass thickness. All mass is assumed to be in direct contact with the conditioned space. Concrete separated from the heated volume by other materials must multiply the listed concrete mass value by the result of the following formula:

Ln(R-value) x (-0.221) + 0.5

Where:

Ln = Natural log
R-value = R-value of material covering concrete

Note: All default values for covered concrete slabs have been adjusted according to this procedure.

2009.2 Mass Description: Mass is divided into two types: structural, and additional.

Structural Mass: Includes heat-storage capacity of all standard building components of a typical structure, including floors, ceilings, and interior and exterior walls in Btu/ft²●°F of floor area. It also assumes exterior wall, interior wall, and ceiling surface area approximately equals three times the floor area.

Additional Mass: Includes any additional building material not part of the normal structure, which is added specifically to increase the building's thermal-storage capability. This category includes masonry fireplaces, water or trombe walls, and extra layers of sheetrock. Coefficients are in Btu/ft²●°F of surface area of material exposed to conditioned space. The coefficient for water is Btu/°F gallon.

2009.3 Component Description: Light frame assumes one inch thick wood flooring with five-eighths inch sheetrock on ceilings and interior walls, and walls consisting of either five-eighths inch sheetrock or solid logs. Slab assumes a four inch concrete slab on or below grade, with five-eighths inch sheetrock on exterior and interior walls and ceiling, and with separate values for interior or exterior wall insulation. Adjustments for slab covering is based on R-value of material. Additional mass values are based on the density multiplied by the specific heat of the material adjusted for listed thickness.

TABLE 20-10
DEFAULT MASS VALUES

Structural Mass M-value floor area	Btu/ft^2 • °F
Light Frame:	
Joisted/post & beam floor, sheetrock walls and ceilings	3.0
Joisted/post & beam floor, log walls,sheetrock ceilings	4.0
Slab With Interior Wall Insulation:	
Slab, no covering or tile, sheetrock walls and ceilings	10.0
Slab, hardwood floor covering, sheetrock walls and ceilings	7.0
Slab, carpet and pad, sheetrock walls and ceilings	5.0
Slab With Exterior Wall Insulation:	
Slab, no covering or tile, sheetrock walls and ceilings	12.0
Slab, hardwood floor covering, sheetrock walls and ceilings	9.0
Slab, carpet and pad, sheetrock walls and ceilings	7.0

Additional Mass M-Value:	Btu/ft^2 • °F surface area
Gypsum wallboard, 1/2-inch thickness	0.54
Gypsum wallboard, 5/8-inch thickness	0.68
Hardwood floor	1.40
Concrete/Brick, 4 inch-thickness	10.30
Concrete/Brick, 6 inch-thickness	15.40
	Btu/°F • gallon
Water, 1 gallon	8.0

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-2009, filed 10/18/93, effective 4/1/94.]

REFERENCE STANDARD COMMERCIAL BUILDING DESIGN BY SYSTEMS ANALYSIS

WAC 51-11-99901 Section 1—Scope.

1.1 General: This Standard establishes design criteria in terms of total energy consumption of a building, including all of its systems. General principles and requirements are outlined in Section 2. Specific modeling assumptions are listed in Section 3.

The building permit application for projects utilizing this Standard shall include in one submittal all building and mechanical drawings and all information necessary to verify that the design for the project corresponds with the annual energy analysis. If credit is proposed to be taken for lighting energy savings, then electrical drawings shall also be included with the building permit application.

Due to the various assumptions that are necessary, the results of the analysis shall not be construed as a guarantee of the actual energy performance of the project.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-99901, filed 10/18/93, effective 4/1/94.]

WAC 51-11-99902 Section 2—General principles and requirements.

2.1 Energy Analysis: Compliance with this Standard will require an analysis of the annual energy usage, hereinafter called an annual energy analysis.

A building designed in accordance with this Standard will be deemed as complying with this Code, if

a. The calculated annual energy consumption is not greater than that of a corresponding "standard design," as defined below and in Section 3,

and;

b. Whose enclosure elements and energy-consuming systems comply with Sections 1310 through 1314, 1410 through 1415, 1440 through 1442, 1450 through 1454 and 1510 through 1513. Buildings shall only vary from those requirements in Sections 1330 through 1334, 1432 through 1438 and 1530 through 1532 where those variations have been accurately and completely modeled. Where variations are not specifically analyzed, the building shall comply with these requirements.

For a proposed building design to be considered similar to a "standard design," it shall utilize the same energy source(s) for the same functions and have equal floor area and the same ratio of envelope area to floor area, environmental requirements, occupancy, climate data and usage operational schedule. Inputs to the energy analysis relating to occupancy and usage shall correspond to the expected occupancy and usage of the building.

Except as noted below, the systems identified, and, to the extent possible, the assumptions made in assigning energy inputs to each system, shall be the same for the standard design and the proposed design. When electrically driven heat pumps, other than multiple units connected to a common water loop, are employed to provide all or part of the heat for the proposed design, the standard design shall also, for the purposes of the analysis, assume that electrically driven heat pump, in conformance with Chapter 14 of the Code and having capacity at least as great as those used in the proposed design are employed.

2.2 Design: The standard design and the proposed design shall be designed on a common basis as specified herein:

a. The comparison shall be expressed as kBtu input per square foot of conditioned floor area per year at the building site. Buildings which use electricity as the only fuel source, comparisons may be expressed in kWh. When converting electricity in kWh to kBtu a multiplier of 3.413 kWh/kBtu shall be used.

b. If the proposed design results in an increase in consumption of one energy source and a decrease in another energy source, even though similar sources are used for similar purposes, the difference in each energy source shall be converted to equivalent energy units for purposes of comparing the total energy used.

2.3 Analysis Procedure: The analysis of the annual energy usage of the standard and the proposed building and system design shall meet the following criteria:

a. The building heating/cooling load calculation procedure used for annual energy consumption analysis shall be detailed to permit the evaluation of effect of factors specified in Section 2.4.

b. The calculation procedure used to simulate the operation of the building and its service systems through a full-year operating period shall be detailed to permit the evaluation of the effect of system design, climatic factors, operational characteristics and mechanical equipment on annual energy usage. Manufacturer's data or comparable field test data shall be used when available in the simulation of systems and equipment. The calculation procedure shall be based upon 8,760 hours of operation of the building and its service systems and shall utilize the design methods, specified in Standards RS-27, -11, -12 and -13 listed in Chapter 7 and 17 of the Code or in other programs approved by the building official.

2.4 Calculation Procedure: The calculation procedure shall cover the following items:

a. Design requirements—Design heating conditions and design cooling conditions as defined in Chapter 12 of the Code.

b. Climatic data—Coincident hourly data for temperatures, solar radiation, wind and humidity of typical days in the year representing seasonal variation.

c. Building data—Orientation, size, shape, mass, air and heat transfer characteristics.

d. Operational characteristics—Temperature, humidity, ventilation, illumination and control mode for occupied and unoccupied hours.

e. Mechanical equipment—Design capacity and part load profile.

f. Building loads—Internal heat generation, lighting, equipment and number of people during occupied and unoccupied periods.

Exception: Proposed designs having an area of 25,000 square feet or less are exempt from the full-year energy analysis described in section 2.3(b). However, comparison of energy consumption between the proposed design and the standard design shall be provided based on one of the programs suggested in Section 4.2 for these buildings.

2.5 Documentation: All analyses submitted shall be accompanied by an energy analysis comparison report. The report shall provide technical detail on the two building and system designs and on the data used in and resulting from the comparative analysis to verify that both the analysis and the designs meet the criteria of Section 1.

The calculation procedure for the standard design and the proposed design shall separately identify the calculated annual energy consumption for each different occupancy type, if possible, for each of the following end uses:

a. Interior lighting;
b. Parking lighting;
c. Exterior lighting;
d. Space heating;
e. Space cooling;
f. Interior ventilation/fans;
g. Parking ventilation/fans;
h. Exhaust fans;
i. Service water heating;
j. Elevators;
k. Appliances.

Energy consumption of the following items shall be included but is not required to be separated out by each individual item.

a. Office equipment;
b. Refrigeration other than comfort cooling;
c. Cooking; and
d. Any other energy-consuming equipment.

The specifications of the proposed building project used in the analysis shall be as similar as is reasonably practical to those in the plans submitted for a building permit.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-99902, filed 10/18/93, effective 4/1/94.]

WAC 51-11-99903 Section 3—Specific modeling assumptions.

The specific modeling assumptions consist of methods and assumptions for calculating the standard energy consumption for the standard building and the proposed energy consumption of the proposed design. In order to maintain consistency between the standard and the proposed design energy consumptions, the input assumptions in this section shall be used.

"Prescribed" assumptions shall be used without variation. "Default" assumptions shall be used unless the designer can demonstrate that a different assumption better characterizes the building's use over its expected life. Any modification of a default assumption shall be used in modeling both the standard building and the proposed design unless the designer demonstrates a clear cause to do otherwise.

3.1 Orientation and Shape: The standard building shall consist of the same number of stories and gross floor area for each story as the proposed design. Each floor shall be oriented exactly as the proposed design. The geometric form shall be the same as the proposed design.

3.2 Internal Loads: Internal loads shall be modeled as noted in the following parts of Section 3.2. The systems specified for calculating the standard energy consumption in Section 3.2 are intended only as constraints in calculating the consumption. They are not intended as requirements or recommendations for systems to be used in the proposed building or for the calculation of the proposed energy consumption.

3.2.1 Occupancy: Occupancy schedules shall be default assumptions. The same assumptions shall be made in computing proposed energy consumption as were used in calculating the standard energy consumption. Occupancy levels vary by building type and time of day. Table 3-1 establishes the density presented as ft^2/person of conditioned floor area that will be used by each building type. Table 3-2 establishes the percentage of the people that are in the building by hours of the day for each building type.

3.2.2 Lighting: The interior and exterior lighting power allowance for calculating the standard energy consumption shall be determined from Sections 1531 and 1532. The lighting power used to calculate the proposed energy consumption shall be the actual lighting power of the proposed lighting design. Exempt lighting in the standard

design shall be equal to the exempt lighting in the proposed design.

Lighting levels in buildings vary based on the type of uses within buildings, by area and by time of day. Table 3-2 contains the lighting energy profiles which establish the percentage of the lighting load that is switched ON in each prototype or reference building by hour of the day. These profiles are default assumptions and can be changed if required when calculating the standard energy consumption to provide, for example, a 12 hour rather than an 8 hour work day or to reflect the use of automatic lighting controls. The lighting schedules used in the standard and proposed designs shall be identical and shall reflect the type of controls to be installed in the proposed design. The controls in the proposed design shall comply with the requirements in Section 1513 and no credit shall be given for the use of any additional controls, automatic or otherwise.

3.2.3 Receptacle: Receptacle loads and profiles are default assumptions. The same assumptions shall be made in calculating proposed energy consumption as were used in calculating the standard energy consumption. Receptacle loads include all general service loads that are typical in a building. These loads should include additional process electrical usage but exclude HVAC primary or auxiliary electrical usage. Table 3-1 establishes the density in W/ft^2 to be used. The receptacle energy profiles shall be the same as the lighting energy profiles in Table 3-2. This profile establishes the percentage of the receptacle load that is switched ON by hour of the day and by building type.

3.3 Envelope

3.3.1 Insulation and Glazing: Glazing area and U-factor of the standard building envelope shall be determined by using the Target UA requirements of Equation 13-1 and U-factor values in Table 13-1 or 13-2. The glazing solar heat gain coefficient (SHGC) or shading coefficient of the standard building shall be the lesser of 0.65 and the SHGC required by Table 13-1 or 13-2 for the vertical or overhead glazing area for the appropriate wall type. The opaque area U-factors of the standard building shall be determined by using the Target UA requirements from Equation 13-1 including the appropriate mass for walls. The insulation characteristics and glazing area are prescribed assumptions for the standard building for calculating the standard energy consumption. In the calculation of the proposed energy consumption of the proposed design, the envelope characteristics of the proposed design shall be used. The standard design shall use the maximum glazing areas listed in Tables 13-1 or 13-2 for the appropriate use. The distribution of vertical glazing in the gross wall area of the standard design shall be equal to the distribution of vertical glazing in the proposed design or shall constitute an equal percentage of gross wall area on all sides of the standard building. The distribution of overhead glazing in the gross roof/ceiling area of the standard design shall be equal to the distribution of overhead glazing in the proposed design. The distribution of doors in the gross opaque wall area of the standard design shall be identical to the distribution of doors in the proposed design.

3.3.2 Infiltration: For standard and proposed buildings, infiltration assumptions shall be equal.

3.3.3 Envelope and Ground Absorptivities: For the standard building, absorptivity assumptions shall be default assumptions for computing the standard energy consumption and default assumptions for computing the proposed energy consumption. The solar absorptivity of opaque elements of the building envelope shall be assumed to be 70 percent. The solar absorptivity of ground surfaces shall be assumed to be 80 percent (20 percent reflectivity).

3.3.4 Window Treatment: No draperies or blinds shall be modeled for the standard or proposed building.

3.3.5 Shading: For standard building and the proposed design, shading by permanent structures and terrain shall be taken into account for computing energy consumption whether or not these features are located on the building site. A permanent fixture is one that is likely to remain for the life of the proposed design. Credit may be taken for external shading devices that are part of the proposed design.

3.4 HVAC Systems and Equipment: For the standard building, the HVAC system used shall be the system type used in the proposed design. If the proposed HVAC system type does not comply with Sections 1432 through 1438, the standard design system shall comply in all respects with those sections.

Exception: When approved by the building official, a prototype HVAC system may be used, if the proposed design system cannot be modified to comply with Sections 1422 and 1432 through 1438, as a standard design. Use of prototype HVAC systems shall only be permitted for the building types listed below. For mixed-use buildings, the floor space of each building type is allocated within the floor space of the standard building. The specifications and requirements for the HVAC systems of prototype buildings shall be those in Table 3-3.

1. assembly
2. health/institutional
3. hotel/motel
4. light manufacturing
5. office (business)
6. restaurant
7. retail (mercantile)
8. school (educational)
9. warehouse (storage)

3.4.1 HVAC Zones: HVAC zones for calculating the standard energy consumption and proposed energy consumption shall consist of at least four perimeter and one interior zone per floor, with at least one perimeter zone facing each orientation. The perimeter zones shall be fifteen feet in width or one-third the narrow dimension of the building when this dimension is between 30 and 45 feet inclusive or half the narrow dimension of the building when this dimension is less than thirty feet.

Exceptions:

1. Building types such as assembly or warehouse may be modeled as a single zone if there is only one space.
2. Thermally similar zones, such as those facing one orientation on different floors, may be grouped together for the purposes of either the standard or proposed building simulation.

3.4.2 Process Equipment Sizing: Process sensible and latent loads shall be equal in calculating both the standard energy consumption and the proposed energy consumption. The designer shall document the installation of process equipment and the size of process loads.

3.4.3 HVAC Equipment Sizing: The equipment shall be sized to include the capacity to meet the process loads. For calculating the proposed energy consumption, actual air flow rates and installed equipment size shall be used in the simulation. Equipment sizing in the simulation of the proposed design shall correspond to the equipment intended to be selected for the design and the designer shall not use equipment sized automatically by the simulation tool.

Equipment sizing for the standard design shall be based on the same as the proposed design or lesser sizing ratio of installed system capacity to the design load for heating and for cooling.

Chilled water systems for the standard building shall be modeled using a reciprocating chiller for systems with total cooling capacities less than 175 tons, and centrifugal chillers for systems with cooling capacities of 175 tons or greater. For systems with cooling capacities of 600 tons or more the standard energy consumption shall be calculated using two centrifugal chillers, lead/lag controlled. Chilled water shall be assumed to be controlled at a constant 44 degree F temperature rise, from 44 degrees F to 56 degrees F, operating at 65 percent combined impeller and motor efficiency. Condenser water pumps shall be sized using a 10 degree F temperature rise, operating at 60 percent combined impeller and motor efficiency. The cooling tower shall be an open circuit, centrifugal blower type sized for the larger of 85 degrees F leaving water temperature or 10 degrees F approach to design wetbulb temperature. The tower shall be controlled to provide a 65 degrees F leaving water temperature whenever weather conditions permit, floating up to design leaving water temperature at design conditions.

3.4.4 Variable Speed: The energy of the combined fan system per air volume at design conditions (w/cfm) of the proposed design shall be equal to that of the standard design.

Variable air volume fan systems in the standard building shall be variable speed.

3.5 Service Water Heating: The service water heating loads for prototype buildings are defined in terms of Btu/person-hour in Table 3-1. The values in the table refer to energy content of the heated water. The service water heating loads from Table 3-1 are default for all buildings. The same service-water-heating load assumptions shall be made in calculating proposed energy consumption as were used in calculating the standard energy consumption. The service water heating system for the standard building shall be modeled as closely as possible as if it were designed in accordance with the ASHRAE Handbook, 1987 HVAC Systems and Applications Volume and meeting all the requirements of Sections 1440 through 1442.

3.6 Controls

3.6.1: All occupied conditioned spaces in standard and proposed design buildings in all climates shall be simulated as being both heated and cooled.

Exceptions:

1. If a building or portion of a building is to be provided with only heating or cooling, both the standard building and the proposed design shall be simulated using the same assumptions.
2. If warehouses are not intended to be mechanically cooled, both the standard and proposed energy consumption shall be modeled assuming no mechanical cooling.

3.6.2: Space temperature controls for the standard building, shall be set at 70 degrees F for space heating and 75 degrees F for space cooling, with a deadband in accordance with Section 1412.2. The system shall be OFF during off-hours according to the appropriate schedule in Table 3-2, except that the heating system shall cycle ON if any space should drop below the night setback setting 55 degrees F. There shall be no similar setpoint during the cooling season. Lesser deadband ranges may be used in calculating the proposed energy consumption.

Exceptions:

1. Setback shall not be modeled in determining either the standard or proposed energy consumption if setback is not realistic for the proposed design such as a facility being operated 24 hours/day. For instance, health facilities need not have night setback during the heating season.
2. If deadband controls are not to be installed, the proposed energy consumption shall be calculated with both heating and cooling thermostat setpoints set to the same value between 70 degrees F and 75 degrees F inclusive, assumed to be constant for the year.

3.6.3: When providing for outdoor air ventilation when calculating the standard energy consumption, controls shall be assumed to close the outside air intake to reduce the flow of outside air to 0.0 cfm during "setback" and "unoccupied" periods. Ventilation using inside air may still be required to maintain scheduled setback temperature. Outside air ventilation, during occupied periods, shall be as required by the Washington State Ventilation and Indoor Air Quality Code chapter 51-13 WAC.

3.6.4: If humidification is to be used in the proposed design, the same level of humidification and system type shall be used in the standard building.

TABLE 3-1

Acceptable Occupancy Densities, Receptacle Power Densities and Service Hot Water Consumption[1]

Building Type	Occupancy Density[2] Sq. Ft./Person (Btu/h·sq. ft)	Receptable Power Density[3] Watts/Sq. Ft. (Btu/h·sq. ft.)	Service Hot Water Quantities[4] Btu/h·person
Assembly	50 (4.60)	0.25 (0.85)	215
Health/Institutional	200 (1.15)	1.00 (3.41)	135
Hotel/Motel	250 (0.92)	0.25 (0.85)	1,110
Light Manufacturing	750 (0.31)	0.20 (0.68)	225
Office	275 (0.84)	0.75 (2.56)	175
Parking Garage	N.A.	N.A.	N.A.
Restaurant	100 (2.30)	0.10 (0.34)	390
Retail	300 (0.77)	0.25 (0.85)	135
School	75 (3.07)	0.50 (1.71)	215
Warehouse	15,000 (0.02)	0.10 (0.34)	225

1. The occupancy densities, receptacle power densities and service hot water consumption values are from ASHRAE Standard 90.1-1989 and addenda.
2. Values are in square feet of conditioned floor area per person. Heat generation in Btu per person per hour is 230 sensible and 190 latent. Figures in parentheses are equivalent Btu per hour per square foot.
3. Values are in Watts per square foot of conditioned floor area. Figures in parentheses are equivalent Btu per hour per square foot. These values are the minimum acceptable. If other process loads are not input (such as for computers, cooking, refrigeration, etc.), it is recommended that receptacle power densities be increased until total process energy consumption is equivalent to 25% of the total.
4. Values are in Btu per person per hour.

TABLE 3-2a

Assembly Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	0	0	0	5	5	5	off	off	off	0	0	0	0	0	0
2 (1-2am)	0	0	0	5	5	5	off	off	off	0	0	0	0	0	0
3 (2-3am)	0	0	0	5	5	5	off	off	off	0	0	0	0	0	0
4 (3-4am)	0	0	0	5	5	5	off	off	off	0	0	0	0	0	0
5 (4-5am)	0	0	0	5	5	5	off	off	off	0	0	0	0	0	0
6 (5-6am)	0	0	0	5	5	5	on	off	off	0	0	0	0	0	0
7 (6-7am)	0	0	0	40	5	5	on	on	on	0	0	0	0	0	0
8 (7-8am)	0	0	0	40	30	30	on	on	on	0	0	0	0	0	0
9 (8-9am)	20	20	10	40	30	30	on	on	on	0	0	0	0	0	0
10 (9-10am)	20	20	10	75	50	30	on	on	on	5	5	5	0	0	0
11 (10-11am)	20	20	10	75	50	30	on	on	on	5	5	5	0	0	0
12 (11-12pm)	80	60	10	75	50	30	on	on	on	35	20	10	0	0	0
13 (12-1pm)	80	60	10	75	50	65	on	on	on	5	0	0	0	0	0
14 (1-2pm)	80	60	70	75	50	65	on	on	on	5	0	0	0	0	0
15 (2-3pm)	80	60	70	75	50	65	on	on	on	5	0	0	0	0	0
16 (3-4pm)	80	60	70	75	50	65	on	on	on	5	0	0	0	0	0
17 (4-5pm)	80	60	70	75	50	65	on	on	on	5	0	0	0	0	0
18 (5-6pm)	80	60	70	75	50	65	on	on	on	0	0	0	0	0	0
19 (6-7pm)	20	60	70	75	50	65	on	on	on	0	0	0	0	0	0
20 (7-8pm)	20	60	70	75	50	65	on	on	on	0	65	65	0	0	0
21 (8-9pm)	20	60	70	75	50	65	on	on	on	0	30	30	0	0	0
22 (9-10pm)	20	80	70	75	50	65	on	on	on	0	0	0	0	0	0
23 (10-11pm)	10	10	20	25	50	5	on	on	on	0	0	0	0	0	0
24 (11-12am)	0	0	0	5	5	5	off	off	off	0	0	0	0	0	0
Total/Day	710	750	700	1155	800	845	1800	1700	1700	70	125	115	0	0	0
Total/Week		50.50	hours		74.20	hours		124	hours		5.9	hours		0	hours
Total/Year		2633	hours		3869	hours		6465	hours		308	hours		0	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2b

Health Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	0	0	0	10	10	5	on	on	on	1	1	1	0	0	0
2 (1-2am)	0	0	0	10	10	5	on	on	on	1	1	1	0	0	0
3 (2-3am)	0	0	0	10	10	5	on	on	on	1	1	1	0	0	0
4 (3-4am)	0	0	0	10	10	5	on	on	on	1	1	1	0	0	0
5 (4-5am)	0	0	0	10	10	5	on	on	on	1	1	1	0	0	0
6 (5-6am)	0	0	0	10	10	5	on	on	on	1	1	1	0	0	0
7 (6-7am)	0	0	0	10	10	5	on	on	on	1	1	1	0	0	0
8 (7-8am)	10	10	0	50	20	5	on	on	on	17	1	1	2	2	0
9 (8-9am)	50	30	5	90	40	10	on	on	on	58	20	1	75	46	2
10 (9-10am)	80	40	5	90	40	10	on	on	on	66	28	1	100	70	2
11 (10-11am)	80	40	5	90	40	10	on	on	on	78	30	1	100	70	2
12 (11-12pm)	80	40	5	90	40	10	on	on	on	82	30	1	100	70	2
13 (12-1pm)	80	40	5	90	40	10	on	on	on	71	24	1	75	51	2
14 (1-2pm)	80	40	5	90	40	10	on	on	on	82	24	1	100	51	2
15 (2-3pm)	80	40	5	90	40	10	on	on	on	78	23	1	100	51	2
16 (3-4pm)	80	40	5	90	40	10	on	on	on	74	23	1	100	51	2
17 (4-5pm)	80	40	0	30	40	5	on	on	on	63	23	1	100	51	0
18 (5-6pm)	50	10	0	30	40	5	on	on	on	41	10	1	100	25	0
19 (6-7pm)	30	10	0	30	10	5	on	on	on	18	1	1	52	2	0
20 (7-8pm)	30	0	0	30	10	5	on	on	on	18	1	1	52	0	0
21 (8-9pm)	20	0	0	30	10	5	on	on	on	18	1	1	52	0	0
22 (9-10pm)	20	0	0	30	10	5	on	on	on	10	1	1	28	0	0
23 (10-11pm)	0	0	0	30	10	5	on	on	on	1	1	1	0	0	0
24 (11-12am)	0	0	0	10	10	5	on	on	on	1	1	1	0	0	0
Total/Day	850	380	40	1060	550	160	2400	2400	2400	783	249	24	1136	540	16
Total/Week		46.70	hours		60.10	hours		168	hours		41.88	hours		62.36	hours
Total/Year		2435	hours		3134	hours		8760	hours		2148	hours		3251	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2c

Hotel/Motel Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	90	90	70	20	20	30	on	on	on	20	20	25	40	44	55
2 (1-2am)	90	90	70	15	20	30	on	on	on	15	15	20	33	35	55
3 (2-3am)	90	90	70	10	10	20	on	on	on	15	15	20	33	35	43
4 (3-4am)	90	90	70	10	10	20	on	on	on	15	15	20	33	35	43
5 (4-5am)	90	90	70	10	10	20	on	on	on	20	20	20	33	35	43
6 (5-6am)	90	90	70	20	10	20	on	on	on	25	25	30	33	35	43
7 (6-7am)	70	70	70	40	30	30	on	on	on	50	40	50	42	40	52
8 (7-8am)	40	50	70	50	30	40	on	on	on	60	50	50	42	32	52
9 (8-9am)	40	50	50	40	40	40	on	on	on	55	50	50	52	45	65
10 (9-10am)	20	30	50	40	40	30	on	on	on	45	50	55	52	45	65
11 (10-11am)	20	30	50	25	30	30	on	on	on	40	45	50	40	42	53
12 (11-12pm)	20	30	30	25	25	30	on	on	on	45	50	50	51	60	60
13 (12-1pm)	20	30	30	25	25	30	on	on	on	40	50	40	51	65	53
14 (1-2pm)	20	30	20	25	25	20	on	on	on	35	45	40	51	65	51
15 (2-3pm)	20	30	20	25	25	20	on	on	on	30	40	30	51	65	50
16 (3-4pm)	30	30	20	25	25	20	on	on	on	30	40	30	51	65	44
17 (4-5pm)	50	30	30	25	25	20	on	on	on	30	35	30	63	65	64
18 (5-6pm)	50	50	40	25	25	20	on	on	on	40	40	40	80	75	62
19 (6-7pm)	50	60	40	60	60	50	on	on	on	55	55	50	86	80	65
20 (7-8pm)	70	60	60	80	70	70	on	on	on	60	55	50	70	80	63
21 (8-9pm)	70	60	60	90	70	80	on	on	on	50	50	40	70	75	63
22 (9-10pm)	80	70	80	80	70	60	on	on	on	55	55	50	70	75	63
23 (10-11pm)	90	70	80	60	60	50	on	on	on	45	40	40	45	55	40
24 (11-12am)	90	70	80	30	30	30	on	on	on	25	30	20	45	55	40
Total/Day	1390	1390	1300	855	785	810	2400	2400	2400	915	930	900	1217	1303	1287
Total/Week		96.40	hours		58.70	hours		168.0	hours		64.05	hours		86.75	hours
Total/Year		5026	hours		3061	hours		8760	hours		3340	hours		4523	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2d

Light Manufacuring Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
2 (1-2am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
3 (2-3am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
4 (3-4am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
5 (4-5am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
6 (5-6am)	0	0	0	10	5	5	off	off	off	8	8	7	0	0	0
7 (6-7am)	10	10	5	10	10	5	on	on	off	7	7	4	0	0	0
8 (7-8am)	20	10	5	30	10	5	on	on	off	19	11	4	35	16	0
9 (8-9am)	95	30	5	90	30	5	on	on	off	35	15	4	69	14	0
10 (9-10am)	95	30	5	90	30	5	on	on	off	38	21	4	43	21	0
11 (10-11am)	95	30	5	90	30	5	on	on	off	39	19	4	37	18	0
12 (11-12pm)	95	30	5	90	30	5	on	on	off	47	23	6	43	25	0
13 (12-1pm)	50	10	5	80	15	5	on	on	off	57	20	6	58	21	0
14 (1-2pm)	95	10	5	90	15	5	on	on	off	54	19	9	48	13	0
15 (2-3pm)	95	10	5	90	15	5	on	on	off	34	15	6	37	8	0
16 (3-4pm)	95	10	5	90	15	5	on	on	off	33	12	4	37	4	0
17 (4-5pm)	95	10	5	90	15	5	on	on	off	44	14	4	46	5	0
18 (5-6pm)	30	5	5	50	5	5	on	on	off	26	7	4	62	6	0
19 (6-7pm)	10	5	0	30	5	5	on	off	off	21	7	4	20	0	0
20 (7-8pm)	10	0	0	30	5	5	on	off	off	15	7	4	12	0	0
21 (8-9pm)	10	0	0	20	5	5	on	off	off	17	7	4	4	0	0
22 (9-10pm)	10	0	0	20	5	5	on	off	off	8	9	7	4	0	0
23 (10-11pm)	5	0	0	10	5	5	off	off	off	5	5	4	0	0	0
24 (11-12am)	5	0	0	5	5	5	off	off	off	5	5	4	0	0	0
Total/Day	920	200	60	1040	280	120	1600	1200	0	537	256	113	555	151	0
Total/Week		48.60	hours		56.00	hours		92.00	hours		30.54	hours		29.26	hours
Total/Year		2534	hours		2920	hours		4797	hours		1592	hours		1526	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2e

Office Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
2 (1-2am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
3 (2-3am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
4 (3-4am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
5 (4-5am)	0	0	0	5	5	5	off	off	off	5	5	4	0	0	0
6 (5-6am)	0	0	0	10	5	5	off	off	off	8	8	7	0	0	0
7 (6-7am)	10	10	5	10	10	5	on	on	off	7	7	4	0	0	0
8 (7-8am)	20	10	5	30	10	5	on	on	off	19	11	4	35	16	0
9 (8-9am)	95	30	5	90	30	5	on	on	off	35	15	4	69	14	0
10 (9-10am)	95	30	5	90	30	5	on	on	off	38	21	4	43	21	0
11 (10-11am)	95	30	5	90	30	5	on	on	off	39	19	4	37	18	0
12 (11-12pm)	95	30	5	90	30	5	on	on	off	47	23	6	43	25	0
13 (12-1pm)	50	10	5	80	15	5	on	on	off	57	20	6	58	21	0
14 (1-2pm)	95	10	5	90	15	5	on	on	off	54	19	9	48	13	0
15 (2-3pm)	95	10	5	90	15	5	on	on	off	34	15	6	37	8	0
16 (3-4pm)	95	10	5	90	15	5	on	on	off	33	12	4	37	4	0
17 (4-5pm)	95	10	5	90	15	5	on	on	off	44	14	4	46	5	0
18 (5-6pm)	30	5	5	50	5	5	on	on	off	26	7	4	62	6	0
19 (6-7pm)	10	5	0	30	5	5	on	off	off	21	7	4	20	0	0
20 (7-8pm)	10	0	0	30	5	5	on	off	off	15	7	4	12	0	0
21 (8-9pm)	10	0	0	20	5	5	on	off	off	17	7	4	4	0	0
22 (9-10pm)	10	0	0	20	5	5	on	off	off	8	9	7	4	0	0
23 (10-11pm)	5	0	0	10	5	5	off	off	off	5	5	4	0	0	0
24 (11-12am)	5	0	0	5	5	5	off	off	off	5	5	4	0	0	0
Total/Day	920	200	60	1040	280	120	1600	1200	0	537	256	113	555	151	0
Total/Week		48.60	hours		56.00	hours		92.00	hours		30.54	hours		29.26	hours
Total/Year		2534	hours		2920	hours		4797	hours		1592	hours		1526	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2f

Parking Garage Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)				100	100	100									
2 (1-2am)				100	100	100									
3 (2-3am)				100	100	100									
4 (3-4am)				100	100	100									
5 (4-5am)				100	100	100									
6 (5-6am)				100	100	100									
7 (6-7am)				100	100	100									
8 (7-8am)				100	100	100									
9 (8-9am)				100	100	100									
10 (9-10am)				100	100	100									
11 (10-11am)				100	100	100									
12 (11-12pm)	N/A			100	100	100	Based on likely use			N/A			Included with other occupancies		
13 (12-1pm)				100	100	100									
14 (1-2pm)				100	100	100									
15 (2-3pm)				100	100	100									
16 (3-4pm)				100	100	100									
17 (4-5pm)				100	100	100									
18 (5-6pm)				100	100	100									
19 (6-7pm)				100	100	100									
20 (7-8pm)				100	100	100									
21 (8-9pm)				100	100	100									
22 (9-10pm)				100	100	100									
23 (10-11pm)				100	100	100									
24 (11-12am)				100	100	100									
Total/Day				2400	2400	2400									
Total/Week					168	hours									
Total/Year					8760	hours									

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2g

Restaurant Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	15	30	20	15	20	20	on	on	on	20	20	25	0	0	0
2 (1-2am)	15	25	20	15	15	15	on	on	on	15	15	20	0	0	0
3 (2-3am)	5	5	5	15	15	15	on	on	on	15	15	20	0	0	0
4 (3-4am)	0	0	0	15	15	15	off	off	off	0	0	0	0	0	0
5 (4-5am)	0	0	0	15	15	15	off	off	off	0	0	0	0	0	0
6 (5-6am)	0	0	0	20	15	15	off	off	off	0	0	0	0	0	0
7 (6-7am)	0	0	0	40	30	30	off	off	off	0	0	0	0	0	0
8 (7-8am)	5	0	0	40	30	30	on	off	off	60	0	0	0	0	0
9 (8-9am)	5	0	0	60	60	50	on	off	off	55	0	0	0	0	0
10 (9-10am)	5	5	0	60	60	50	on	on	off	45	50	0	0	0	0
11 (10-11am)	20	20	10	90	80	70	on	on	on	40	45	50	0	0	0
12 (11-12pm)	50	45	20	90	80	70	on	on	on	45	50	50	0	0	0
13 (12-1pm)	80	50	25	90	80	70	on	on	on	40	50	40	0	0	0
14 (1-2pm)	70	50	25	90	80	70	on	on	on	35	45	40	0	0	0
15 (2-3pm)	40	35	15	90	80	70	on	on	on	30	40	30	0	0	0
16 (3-4pm)	20	30	20	90	80	70	on	on	on	30	40	30	0	0	0
17 (4-5pm)	25	30	25	90	80	60	on	on	on	30	35	30	0	0	0
18 (5-6pm)	50	30	35	90	90	60	on	on	on	40	40	40	0	0	0
19 (6-7pm)	80	70	55	90	90	60	on	on	on	55	55	50	0	0	0
20 (7-8pm)	80	90	65	90	90	60	on	on	on	60	55	50	0	0	0
21 (8-9pm)	80	70	70	90	90	60	on	on	on	50	50	40	0	0	0
22 (9-10pm)	50	65	35	90	90	60	on	on	on	55	55	50	0	0	0
23 (10-11pm)	35	55	20	50	50	50	on	on	on	45	40	40	0	0	0
24 (11-12am)	20	35	20	30	30	30	on	on	on	25	30	20	0	0	0
Total/Day	750	740	485	1455	1365	1115	2000	1800	1700	790	730	625	0	0	0
Total/Week		49.75	hours		97.55	hours		135	hours		53.05	hours		0	hours
Total/Year		2594	hours		5086	hours		7039	hours		2766	hours		0	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2h

Retail Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	0	0	0	5	5	5	off	off	off	4	11	7	0	0	0
2 (1-2am)	0	0	0	5	5	5	off	off	off	5	10	7	0	0	0
3 (2-3am)	0	0	0	5	5	5	off	off	off	5	8	7	0	0	0
4 (3-4am)	0	0	0	5	5	5	off	off	off	4	6	6	0	0	0
5 (4-5am)	0	0	0	5	5	5	off	off	off	4	6	6	0	0	0
6 (5-6am)	0	0	0	5	5	5	off	off	off	4	6	6	0	0	0
7 (6-7am)	0	0	0	5	5	5	on	on	off	4	7	7	0	0	0
8 (7-8am)	10	10	0	20	10	5	on	on	off	15	20	10	12	9	0
9 (8-9am)	20	20	0	50	30	10	on	on	on	23	24	12	22	21	0
10 (9-10am)	50	50	10	90	60	10	on	on	on	32	27	14	64	56	11
11 (10-11am)	50	60	20	90	90	40	on	on	on	41	42	29	74	66	13
12 (11-12pm)	70	80	20	90	90	40	on	on	on	57	54	31	68	68	35
13 (12-1pm)	70	80	40	90	90	60	on	on	on	62	59	36	68	68	37
14 (1-2pm)	70	80	40	90	90	60	on	on	on	61	60	36	71	69	37
15 (2-3pm)	70	80	40	90	90	60	on	on	on	50	49	34	72	70	39
16 (3-4pm)	80	80	40	90	90	60	on	on	on	45	48	35	72	69	41
17 (4-5pm)	70	80	40	90	90	60	on	on	on	46	47	37	73	66	38
18 (5-6pm)	50	60	20	90	90	40	on	on	off	47	46	34	68	58	34
19 (6-7pm)	50	20	10	60	50	20	on	on	off	42	44	25	68	47	3
20 (7-8pm)	30	20	0	60	30	5	on	on	off	34	36	27	58	43	0
21 (8-9pm)	30	20	0	50	30	5	on	on	off	33	29	21	54	43	0
22 (9-10pm)	0	10	0	20	10	5	off	on	off	23	22	16	0	8	0
23 (10-11pm)	0	0	0	5	5	5	off	off	off	13	16	10	0	0	0
24 (11-12am)	0	0	0	5	5	5	off	off	off	8	13	6	0	0	0
Total/Day	720	750	280	1115	985	525	1500	1600	900	662	690	459	844	761	288
Total/Week		46.30	hours		70.85	hours		100	hours		44.59	hours		52.69	hours
Total/Year		2414	hours		3694	hours		5214	hours		2325	hours		2747	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2i

School Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	0	0	0	5	5	5	off	off	off	5	3	3	0	0	0
2 (1-2am)	0	0	0	5	5	5	off	off	off	5	3	3	0	0	0
3 (2-3am)	0	0	0	5	5	5	off	off	off	5	3	3	0	0	0
4 (3-4am)	0	0	0	5	5	5	off	off	off	5	3	3	0	0	0
5 (4-5am)	0	0	0	5	5	5	off	off	off	5	3	3	0	0	0
6 (5-6am)	0	0	0	5	5	5	off	off	off	5	3	3	0	0	0
7 (6-7am)	0	0	0	5	5	5	off	off	off	5	3	3	0	0	0
8 (7-8am)	5	0	0	30	5	5	on	off	off	10	3	3	0	0	0
9 (8-9am)	75	10	0	85	15	5	on	on	off	34	3	5	30	0	0
10 (9-10am)	90	10	0	95	15	5	on	on	off	60	5	5	30	0	0
11 (10-11am)	90	10	0	95	15	5	on	on	off	63	5	5	30	0	0
12 (11-12pm)	80	10	0	95	15	5	on	on	off	72	5	5	30	0	0
13 (12-1pm)	80	10	0	80	15	5	on	on	off	79	5	5	30	0	0
14 (1-2pm)	80	0	0	80	5	5	on	off	off	83	3	5	30	0	0
15 (2-3pm)	80	0	0	80	5	5	on	off	off	61	3	3	30	0	0
16 (3-4pm)	45	0	0	70	5	5	on	off	off	65	3	3	15	0	0
17 (4-5pm)	15	0	0	50	5	5	on	off	off	10	3	3	0	0	0
18 (5-6pm)	5	0	0	50	5	5	on	off	off	10	3	3	0	0	0
19 (6-7pm)	15	0	0	35	5	5	on	off	off	19	3	3	0	0	0
20 (7-8pm)	20	0	0	35	5	5	on	off	off	25	3	3	0	0	0
21 (8-9pm)	20	0	0	35	5	5	on	off	off	22	3	3	0	0	0
22 (9-10pm)	10	0	0	30	5	5	on	off	off	22	3	3	0	0	0
23 (10-11pm)	0	0	0	5	5	5	off	off	off	12	3	3	0	0	0
24 (11-12am)	0	0	0	5	5	5	off	off	off	9	3	3	0	0	0
Total/Day	710	50	0	990	170	120	1500	500	0	691	80	84	285	0	0
Total/Week		36.00	hours		52.40	hours		80.00	hours		36.19	hours		14.25	hours
Total/Year		1877	hours		2732	hours		4171	hours		1887	hours		743	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-2j

Warehouse Occupancy[1]

Hour of Day (time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun	Wkdy	Sat	Sun
1 (12-1am)	0	0	0	5	5	5	off	off	off	2	2	2	0	0	0
2 (1-2am)	0	0	0	5	5	5	off	off	off	2	2	2	0	0	0
3 (2-3am)	0	0	0	5	5	5	off	off	off	2	2	2	0	0	0
4 (3-4am)	0	0	0	5	5	5	off	off	off	2	2	2	0	0	0
5 (4-5am)	0	0	0	5	5	5	off	off	off	5	2	2	0	0	0
6 (5-6am)	0	0	0	5	5	5	off	off	off	7	2	2	0	0	0
7 (6-7am)	0	0	0	5	5	5	off	off	off	7	2	2	0	0	0
8 (7-8am)	15	0	0	40	5	5	on	off	off	10	2	2	0	0	0
9 (8-9am)	70	20	0	70	8	5	on	on	off	30	6	2	0	0	0
10 (9-10am)	90	20	0	90	24	5	on	on	off	36	12	2	0	0	0
11 (10-11am)	90	20	0	90	24	5	on	on	off	36	12	2	30	0	0
12 (11-12pm)	90	20	0	90	24	5	on	on	off	46	17	2	0	0	0
13 (12-1pm)	50	10	0	80	5	5	on	on	off	57	4	4	0	0	0
14 (1-2pm)	85	10	0	90	5	5	on	on	off	43	4	4	0	0	0
15 (2-3pm)	85	10	0	90	5	5	on	on	off	38	2	2	0	0	0
16 (3-4pm)	85	10	0	90	5	5	on	on	off	40	2	2	40	0	0
17 (4-5pm)	20	0	0	90	5	5	on	off	off	30	2	2	0	0	0
18 (5-6pm)	0	0	0	30	5	5	off	off	off	18	2	2	0	0	0
19 (6-7pm)	0	0	0	5	5	5	off	off	off	3	2	2	0	0	0
20 (7-8pm)	0	0	0	5	5	5	off	off	off	3	2	2	0	0	0
21 (8-9pm)	0	0	0	5	5	5	off	off	off	3	2	2	0	0	0
22 (9-10pm)	0	0	0	5	5	5	off	off	off	3	2	2	0	0	0
23 (10-11pm)	0	0	0	5	5	5	off	off	off	3	2	2	0	0	0
24 (11-12am)	0	0	0	5	5	5	off	off	off	3	2	2	0	0	0
Total/Day	680	120	0	915	180	120	1000	800	0	429	91	52	70	0	0
Total/Week		35.20	hours		48.75	hours		58.00	hours		22.88	hours		3.50	hours
Total/Year		1835	hours		2542	hours		3024	hours		1193	hours		182	hours

1. Schedules for occupancy, lighting, receptacle, HVAC system and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5 percent emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0 percent when occupancy is 0 percent. THESE VALUES MAY BE USED ONLY IF ACTUAL SCHEDULES ARE NOT KNOWN.

TABLE 3-3
HVAC Systems of Prototype Buildings[3]

Use	System #	Remarks
1. Assembly		
a. Churches (any size)	1	
b. $\leq$ 50,000 ft^2 or $\leq$ 3 floors	1 or 3	Note 2
c. > 50,000 ft^2 or > 3 floors	3	
2. Health		
a. Nursing Home (any size)	2	
b. $\leq$ 15,000 ft^2	1	
c. > 15,000 ft^2 and $\leq$ 50,000 ft^2	4	Note 3
d. > 50,000 ft^2	5	Note 3,4
3. Hotel/Motel		
a. $\leq$ 3 Stories	2	Note 6
b. > 3 Stories	6	Note 7
4. Light Manufacturing	1 or 3	
5. Office		
a. $\leq$ 20,000 ft^2	1	
b. > 20,000 ft^2 and either $\leq$ 3 floors or $\leq$ 75,000 ft^2	4	
c. > 75,000 ft^2 or > 3 floors	5	
6. Restaurant	1 or 3	Note 2
7. Retail		
a. $\leq$ 50,000 ft^2	1 or 3	Note 2
b. > 50,000 ft^2	4 or 5	Note 2
8. Schools		
a. $\leq$ 75,000 ft^2 or $\leq$ 3 floors	1	
b. > 75,000 ft^2 or > 3 floors	3	
9. Warehouse		Note 5

Footnote to TABLE 3-3: The systems and energy types presented in this table are not intended as requirements or recommendations for the proposed design. Floor areas in the table are the total conditioned floor areas for the listed use in the building. The number of floors indicated in the table is the total number of occupied floors for the listed use.

TABLE 3-3 (cont.)
HVAC System Descriptions for Prototype Buildings[1]

HVAC Component	System #1	System #2
System Description	Packaged rooftop single zone, one unit per zone.	Packaged terminal air conditioner with space heater or heat pump, heating or cooling unit per zone.
Fan System Design Supply Circulation Rate	Note 10	Note 11
Supply Fan Control	Constant volume.	Fan cycles with call for heating or cooling.
Return Fan Control	N.A.	N.A.
Cooling System	Direct expansion air cooled	Direct expansion air cooled.
Heating System	Furnace, heat pump, or electric resistance.	Heat pump with electric resistance auxiliary or air conditioner with space heater.
Remarks	Drybulb economizer per Section 1433, heat recovery if required by Section 1436.	No economizer, if not required by Section 1433.

TABLE 3-3 (cont.)
HVAC System Descriptions for Prototype Buildings[1]

HVAC Component	System #3	System #4
System Description	Air handler per zone with central plant.	Packaged rooftop VAV with perimeter reheat and fan-powered terminal units.
Fan System Design Supply Circulation Rate	Note 10	Note 10
Supply Fan Control	Constant volume.	VAV with forward curved centrifugal fan and variable inlet fans.
Return Fan Control	Constant volume.	VAV with forward curved centrifugal fan and discharge dampers.
Cooling System	Chilled water (Note 12)	Direct expansion air cooled.
Heating System	Hot water (Note 13)	Hot water (Note 13) or electric resistance.
Remarks	Drybulb economizer per Section 1433, heat recovery if required by Section 1436.	Drybulb economizer per Section 1433. Minimum VAV setting per Section 1435 Exception 1, Supply air reset by zone of greatest cooling demand, heat recovery if required by Section 1436.

TABLE 3-3 (cont.)
HVAC System Descriptions for Prototype Buildings[1]

HVAC Component	System #5	System #6
System Description	Built-up central VAV with perimeter reheat and fan-powered terminal units	Four-pipe fan coil per zone wit central plant.
Fan System Design Supply Circulation Rate	Note 10	Note 10
Supply Fan Control	VAV with air-foil centrifugal fan and AC frequency variable speed drive.	Fan cycles with call for heating or cooling.
Return Fan Control	VAV with air-foil centrifugal fan and AC frequency variable speed drive.	N.A.
Cooling System	Chilled water (Note 12)	Chilled water (Note 12)
Heating System	Hot water (Note 13) or electric resistance.	Hot water (Note 13) or electric resistance.
Remarks	Drybulb economizer per Section 1433. Minimum VAV setting per Section 1435 Exception 1, Supply air rest by zone of greatest cooling demand, heat recovery if required by Section 1436.	No economizer, if not required by Section 1433.

Numbered Footnotes for TABLE 3-3
HVAC System Descriptions for Prototype Buildings

1. The systems and energy types presented in this Table are not intended as requirements or recommendations for the proposed design.
2. For occupancies such as restaurants, assembly and retail that are part of a mixed use building which, according to Table 3-3, includes a central chilled water plant (systems 3,5, or 6), chilled water system type 3 or 5 shall be used as indicated in the table.
3. Constant volume may be used in zones where pressurization relationships must be maintained by code. Where constant volume is used, the system shall have heat recovery if required by Section 1436. VAV shall be used in all other areas, in accordance with Sections 1432 through 1438.
4. Provide run-around heat recovery systems for all fan systems with a minimum outside air intake greater than 70 percent. Recovery effectiveness shall be 0.50.
5. If a warehouse is not intended to be mechanically cooled, both the standard and proposed designs shall be calculated assuming no mechanical cooling.
6. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 4. Other areas such as offices and retail shall be served by systems listed in Table 3-3 for these occupancy types.
7. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 5. Other areas such as offices and retail shall be served by systems listed in Table 3-3 for these occupancy types.
8. Reserved.
9. Reserved.
10. Design supply air circulation rate shall be based on a supply-air-to-room air temperature difference of 20° F. A higher supply air temperature may be used if required to maintain a minimum circulation rate of 4.5 air changes per hour or 15 cfm per person to each zone served by the system, at design conditions. If return fans are specified, they shall be sized for the supply fan capacity less the required minimum ventilation with outside air, or 75 percent of the supply fan capacity, whichever is larger. Except where noted, supply and return fans shall be operated continuously during occupied hours.
11. Fan energy when included in the efficiency rating of the unit as defined in Section 1411, need not be modeled explicitly for this system. The fan shall cycle with calls for heating or cooling.
12. Chilled water systems shall be modeled using a reciprocating chiller for systems with total cooling capacities less than 175 tons, and centrifugal chillers for systems with cooling capacities of 175 tons or greater. For systems with cooling capacities of 600 tons or more, the standard design energy consumption shall be calculated using two centrifugal chillers, lead/lag controlled. Chilled water shall be assumed to be controlled at a constant 44° F. Chiller water pumps shall be sized using a 12° F temperature rise, from 44° F to 56° F, operating at 65 percent combined impeller and motor efficiency. Condenser water pumps shall be sized using a 10° F temperature rise, operating at 60 percent combined impeller and motor efficiency. The cooling tower shall be an open circuit, centrifugal blower type sized for the larger of 85° F leaving water temperature or 10° F approach to design wetbulb temperature. The tower shall be controlled to provide a 65° F leaving water temperature whenever weather conditions permit, floating up to design leaving water temperatures at design conditions. Chilled water supply temperature shall be reset in accordance with Section 1432.2.2.
13. Hot water system shall include a natural draft fossil fuel or electric boiler. The hot water pump shall be sized based on a 30° F temperature drop, from 180° F to 150° F, operating at a combined impeller and motor efficiency of 60 percent. Hot water supply temperature shall be reset in accordance with Section 1432.2.2.

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-99903, filed 10/18/93, effective 4/1/94.]

WAC 51-11-99904 Section 4—Suggested software for systems analysis approach.

4.1 Programs Acceptable for Projects for Full-Year Hourly Analysis

Program Name	Source
ADM-DOE	ADM Associates 3299 Ramos Circle Sacramento, CA 95827 916-363-8383
Micro-Axcess 10.1, PC	Edison Electric Institute PO Box 1235 Roswell, GA 30077 404-993-2406
Blast 3.0 (Level 193)	Blast Support Office University of Illinois Dept. of Mechanical and Industrial Engineering 1206 W. Green Room 30, MEB Urbana, Il 61801 1-800-842-5278
DOE 2.1	Energy Science and Technology Software Center PO Box 1220 Oakridge, TN 37831-1020 615-576-2606
ESAS	Ross Meriweather Consulting, Engineering 3315 Outrider San Antonio, TX 78247-4405 512-490-7081
ESP-II	Automated Procedures for Engineering Consultants, Inc. Miami Valley Tower, Suite 2100 40 W. 4th St Dayton, OH 45402 513-228-2602
HAP 2.02	Carrier Air Conditioning 655 S. Orcas, Suite 10 Seattle, WA 98108 206-767-6340
MICRO-DOE	Acrosoft International, Inc. 9745 E. Hampden Ave, Suite 230 Denver, CO 80231 303-368-9225
ULTRA 600 Version 11.9	The Trane Co. 3600 Pammel Creek Rd. Lacrosse, WI 54601 608-787-3926

4.2 Programs only Acceptable for Commercial Buildings 25,000 Square Feet or Less

Program Name	Source
ADM.2	ADM Associates 3299 Ramos Circle Sacramento, CA 95827 916-363-8383
ASEAM	Advanced Sciences Inc. 2000 N. 15th St., Suite 407 Arlington, VA 22201-2627 703-243-4900
Building Energy Analysis and Easy DOE	Elite Software PO Drawer 1194 Bryan, TX 77806 409-846-2340
ESE	Sea Gate 5001 W. 80th St., Suite 204 Bloomington, MN 55437 612-844-8000
Trakload 4.0 Load Shaper Market Manager	SRC Systems 1300 Clay St., Suite 850 Oakland, CA 94612 510-839-2700
XENCAP 4.5	XENERGY 492 9th Street, Suite 220 Oakland, CA 94607 510-891-0446

[Statutory Authority: RCW 19.27A.025. 93-21-052, § 51-11-99904, filed 10/18/93, effective 4/1/94.]

Chapter 51-13 WAC
VENTILATION AND INDOOR AIR QUALITY

WAC

WAC 51-13-100 Chapter 1—Administration and enforcement.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-100, filed 12/18/90, effective 7/1/91.]

WAC 51-13-101 Scope and general requirements.

101.1 Title: This Code shall be known as the Washington State Ventilation and Indoor Air Quality Code. It is herein referred to as "this Code".

101.2 Intent: The purpose of this Code is to provide minimum standards for the design and installation of mechanical ventilation systems, the selection of structural materials used within the conditioned space, and the construction of radon mitigation systems for new construction.

It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques. These provisions are structured to permit compliance with the intent of this Code by demonstration of performance through on site testing or through engineered design. This Code is not intended to abridge any safety or health requirements required under any other applicable codes or ordinances.

101.3 Scope: This Code sets forth minimum requirements for ventilation in all occupancies, including the design of new construction.

101.3.1 Application to Existing Buildings

101.3.1.1 Additions to Existing Buildings: Additions to existing buildings or structures may be made without making the entire building comply, provided that the new addition shall conform to the provisions of this Code.

EXCEPTIONS

1. Additions with less than 500 square feet of conditioned floor area are exempt from the requirements in this code for Whole House Ventilation Systems, Section 302.2.2.
2. Additions or alterations to existing buildings which do not require the construction of foundations, crawlspaces, slabs, or basements shall not be required to meet the requirements for radon protection.

101.3.1.2 Alterations and Repairs: All alterations and repairs may be made to existing or moved buildings built or permitted prior to the enforcement of this Code without making the entire building comply with the provisions of this Code, provided the alterations or repairs comply with this Code.

EXCEPTION: Air handling/conditioning equipment, which is being replaced without alteration or repair of the associated air distribution system is exempt from the requirements of this Code.

101.3.1.3 Historic Buildings: Historic buildings are exempt from this Code only to the extent necessary to preserve those features essential to their historical appearance or function.

[Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-101, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-101, filed 12/18/90, effective 7/1/91.]

WAC 51-13-102 Alternate systems and materials method of design, construction and installation.

102.1 Alternate Materials and Methods of Construction: The provisions of this Code are not intended to prevent the use of any material, method of construction, design or ventilation system not specifically prescribed herein, provided that such construction, design, or ventilation system has been approved by the building official.

The building official may approve any such alternate, provided that the proposed design is satisfactory and complies with the provisions of this Code and that the material, method, or work offered is, for the purpose intended, at least the equivalent of that prescribed in this Code in suitability, effectiveness, safety, and indoor air quality.

The building official may require plans and specifications to be submitted in support of an application for a building permit. Plans and specifications may be required by the building official to be stamped and authenticated by an engineer or architect licensed by the state to practice as such.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-102, filed 12/18/90, effective 7/1/91.]

WAC 51-13-103 Plans and specifications.

103.1 General: With each application for a building permit, and when required by the building official, plans and specifications demonstrating compliance with this Code shall be submitted. The building official may require that plans and specifications be stamped and authenticated by an engineer, architect, or other qualified professional licensed to practice in the state.

103.2 Details: The plans and specifications shall show in sufficient detail pertinent data and features of the materials, equipment and systems as herein governed, including, but not limited to: design criteria, structural panel materials, size and type of apparatus and equipment, systems and equipment controls, provisions for combustion air to fuel burning appliances, and other pertinent data to indicate conformance with the requirements of this Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-103, filed 12/18/90, effective 7/1/91.]

WAC 51-13-104 Enforcement and inspections.

104.1 General: Pertinent data and features of the building and the materials, equipment and/or systems as herein governed shall be subject to inspection by the building official.

104.2 Approvals Required: No materials, equipment, systems, or portions thereof, shall be concealed without first obtaining approval from the building official.

104.3 Tests: Whenever there is insufficient evidence of compliance with any of the provisions in this Code or evidence that any material or construction does not conform to the requirements of this Code, the building official may require tests as proof of compliance to be made at no expense to the local jurisdiction.

Test methods shall be as specified by this Code or by other recognized test standards. If there are no recognized or accepted test methods for the proposed alternate, the building official shall determine test procedures.

104.4 Final Inspection: All materials, equipment, and systems herein governed shall be inspected and approved before the building shall be deemed ready for occupancy.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-104, filed 12/18/90, effective 7/1/91.]

WAC 51-13-105 Validity.

105.1 Validity: If a section, subsection, sentence, clause, or phrase of this Code is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portion of this Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-105, filed 12/18/90, effective 7/1/91.]

WAC 51-13-106 Conflicts with other codes.

106.1 Conflicts with Other Codes: In addition to the requirements of this Code, buildings must conform to the provisions of the State Building Code (Chapter 19.27 RCW and Chapters 51-30, 51-32, 51-34 and 51-26 Washington Administrative Code). In case of conflicts between the Uniform Building, Uniform Plumbing, Uniform Mechanical, and Uniform Fire Codes as adopted and amended in Chapters 51-30, 51-32, 51-34 and 51-26 Washington Administrative Code, the provisions of Chapter 51-13 shall govern. This Code is not intended to abridge any safety or health requirements under any other applicable codes or ordinances.

Where, in any specific case, different sections of this Code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

Wherever in this Code reference is made to the appendix, the provisions of the appendix shall not apply unless specifically adopted.

106.2 Authority: Local legislative authorities are authorized and directed to enforce this Code. Local legislative authorities are authorized to promulgate, adopt, and issue those rules and regulations necessary for the effective and efficient administration of this Code.

[Statutory Authority: RCW 19.27.190. 95-01-128, § 51-13-106, filed 12/21/94, effective 6/30/95; 91-01-102, § 51-13-106, filed 12/18/90, effective 7/1/91.]

WAC 51-13-107 Violations.

107.1 Violations: It shall be unlawful for any persons, firm, or corporation to erect or construct any building, or remodel or rehabilitate any existing building or structure in the state, or allow the same to be done in violation of any of the provisions of this Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-107, filed 12/18/90, effective 7/1/91.]

WAC 51-13-108 Liability.

108.1 Liability: Nothing contained in this Code is intended to be nor shall be construed to create nor form the basis for any liability on the part of any city or county or its officers, employees, or agents for any injury or damage resulting from the failure of a building to conform to the provisions of this Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-108, filed 12/18/90, effective 7/1/91.]

WAC 51-13-200 Definitions.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-200, filed 12/18/90, effective 7/1/91.]

WAC 51-13-201 General.

201.1 General: For the purposes of this Code, certain terms, phrases, words, and their derivatives shall be construed as specified in this section. Words used is the singular include the plural and the plural, the singular. Words used in the masculine gender include the feminine and feminine, the masculine.

Where terms are not defined in this section, the definitions shall be taken from Chapter 2 of the Uniform Building Code.

Where terms are not defined in either this section or Chapter 2 of the Uniform Building Code, they shall have their ordinary accepted meanings within the context with which they are used. Webster's Third International Dictionary of the English Language, Unabridged, copyrighted 1986, shall be considered as providing ordinarily accepted meanings.

[Statutory Authority: RCW 19.27.190. 95-01-128, § 51-13-201, filed 12/21/94, effective 6/30/95; 91-01-102, § 51-13-201, filed 12/18/90, effective 7/1/91.]

WAC 51-13-202 Definitions.

Addition: An extension or increase in floor area or height of a building or structure.

Aggregate: Crushed stone, stone, or other inert material, or combinations thereof having hard, strong, durable pieces.

Air barrier: A continuous material or system of materials utilized for the purpose of minimizing the movement of air across a defined boundary, and capable of withstanding the maximum pressure developed across it, without failing by becoming significantly more leaky.

Air, exhaust: Air removed from a space and not reused therein.

Air, outdoor: Air taken from the external atmosphere and, therefore, not previously circulated through the HVAC system or the conditioned space.

Air, supply: That air delivered to the conditioned space and used for ventilation, heating, cooling, humidification, or dehumidification.

Air, transfer: The movement of indoor air from one space to another.

Air, ventilation: That portion of supply air that is outdoor air plus any recirculated air that has been treated for the purpose of maintaining acceptable indoor air quality.

AMCA: Air Movement and Control Association, Inc.

Approved: As to material and types of construction, refers to approved by the building official as the result of investigation and tests conducted by him, or by reason of accepted principles or tests by recognized authorities, technical or scientific organizations.

ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.

Automatic: Self-acting, operating by its own mechanism when actuated by some impersonal influence, as for example, a change in current strength, pressure, temperature, or mechanical configuration.

Back-draft damper: A damper installed to restrict introduction of unconditioned air from an unconditioned space to a conditioned space.

Barometric damper: Shall be any listed non-manual device that freely allows the flow of air in one direction, but does not allow conditioned air to escape. Any installed combustion air damper shall meet the installation requirements of the manufacturer.

Building official: The officer or other designated authority charged with the administration and enforcement of this Code, or his duly authorized representative.

Certified local government: The local government has been certified by the state historical preservation officer as having established its own historic preservation commission and a program meeting federal and state standards.

CFM: Cubic feet per minute.

Conditioned floor area: The floor area within the conditioned space.

Conditioned space: That part of a building that is heated or cooled or both for the comfort of occupants.

Dehumidistat: An automatic control device which measures changes in humidity and controls a device(s) for maintaining a maximum specified humidity range or level.

Exfiltration: The uncontrolled outward air leakage through cracks and concealed spaces in any building element and around sole plates, wall outlets, duct systems, windows, and doors of a building, caused by the pressure effect of wind and/or the effect of differences in the indoor and outdoor air density.

Gravel: A type of aggregate.

Habitable space (room): Space in a structure for living, sleeping, eating, or cooking. Bathrooms, toilet compartments, closets, halls, storage, or utility space and similar areas, are not considered habitable space. For the purpose of this Code, a single habitable space may consist of adjoining rooms when one half of the area of the common wall is open and unobstructed and provides an opening of not less than one-tenth of the floor area of the interior room or twenty five square feet, whichever is greater.

Heat recovery ventilation system: A device or combination of devices applied to provide the outdoor air for ventilation in which energy is transferred between the intake and exhaust airstream.

Historic buildings: Any structure, collection of structures, and their associated sites, deemed of importance to the history, architecture, or culture of an area by an appropriate local, state, or federal government jurisdiction. This includes structures on official national, state, or local listings such as the National Register of Historic Places, the State Register of Historic Places, state points of historical interest, and registers or listings of historical or architecturally significant sites, places, historic districts, or landmarks as adopted by a certified local government.

Humidistat: An automatic control device which measures changes in humidity and controls a device(s) for maintaining a minimum specified humidity range or level.

HVAC: Heating, ventilating, and air conditioning.

HVI: Home Ventilating Institute of America, Inc.

Infiltration: The uncontrolled inward air leakage through cracks and concealed spaces in any building element and around sole plates, wall outlets, duct systems, windows, and doors of a building, caused by the pressure effect of wind and/or the effect of differences in the indoor and outdoor air density.

"J" Definitions: (Reserved)

"K" Definitions: (Reserved)

"L" Definitions: (Reserved)

Manual: Capable of being operated by human intervention.

Masonry heater: A heating system which is predominantly masonry construction, having a mass of at least 1764 pounds (800 kg) excluding chimney and base. Within the masonry mass are contained a firebox and multiple heat exchange channels which store the heat and allow for extremely high temperature fires to be burned.

Mitigate: To design, select, apply, and install systems, materials, and processes that reduce radon concentrations in the indoor air of a building, and/or prevent entry of radon into the indoor air of a building, so that the average indoor radon concentration is reduced to an acceptable level.

New construction: Any building, addition or change in occupancy permitted on or after the effective date of this Code.

"O" Definitions: (Reserved)

Picocurie, pCi: A measure of radioactive activity equal to one trillion of a curie. A curie is the amount of any radionuclide that undergoes thirty seven billion nuclear disintegrations per second, hence a picocurie is .037 nuclear disintegrations per second.

Picocurie per liter, pCi/L: A common unit of measurement of the concentration of radioactivity in a gas. One pCi/L corresponds to 2.22 radioactive disintegrations per minute per liter of air.

"Q" Definitions: (Reserved)

R value: (See **Thermal resistance (R)**)

Readily accessible: Readily accessible means capable of being reached safely and quickly for operation, repair, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles, or to resort to the use of portable access equipment.

Soil depressurization system (SDS): A radon control technique that depressurizes the space below a concrete slab or other soil gas retarder relative to the space above it. The purpose of SDS is to maintain a slightly lower pressure in the soil gas under the slab or other soil gas retarder, compared to the indoor pressure above it, to ensure that flows are from the indoors to the soil, thus preventing mass transport of radon contaminated soil gas to the indoor air.

Soil gas retarder membrane: A flexible sheet material placed between the soil and the indoor air for the purpose of reducing the flow of soil gas into the building.

Solid fuel burning appliance: Any factory-built appliance designed to burn solid fuels.

Source specific ventilation system: A mechanical ventilation system including all fans, controls, and ducting, which is dedicated to exhausting contaminant-laden air to the exterior of the building from the room or space in which the contaminant is generated.

System: A combination of equipment and/or controls, accessories, interconnecting means, and terminal elements by which air is transferred.

Terminal element: The means by which the transferred air from a system is finally delivered; i.e., registers, diffusers, through-the-wall vents, roof caps, etc.

Thermal resistance (R): The resistance of a material to heat flow, measured as the inverse of heat flow per unit area, per unit time, per unit temperature difference across the thickness of material considered. In this Code, R has units of sq.ft./hr.°F/Btu.

Thermostat: An instrument which measures changes in temperature and control device(s) for maintaining a desired temperature.

Unconditioned space: (See **Conditioned space**)

Ventilation: The process of supplying and removing air by natural or mechanical means to and from any space. Such air may or may not be conditioned.

Ventilation, mechanical: The introduction and distribution of outdoor air and the removal of indoor air by mechanical means.

Ventilation, natural: Ventilation other than by mechanical means.

Virgin polyethylene: Extruded polyethylene sheets made from nonreprocessed resins.

Whole house ventilation system: A mechanical ventilation system, including fans, controls, and ducts, which replaces, by direct or indirect means, air from the habitable rooms with outdoor air.

Wood stove: (See **Solid fuel burning appliance**)

"X" Definitions: (Reserved)

"Y" Definitions: (Reserved)

Zone: A space or group of spaces within a building with heating and/or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device.

[Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-202, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-202, filed 12/18/90, effective 7/1/91.]

WAC 51-13-300 Chapter 3—Ventilation systems.

[Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-300, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-300, filed 12/18/90, effective 7/1/91.]

WAC 51-13-301 Design criteria.

301.1 General: The criteria of this chapter establish the design conditions upon which the minimum ventilation systems are to be based for all occupancies.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-301, filed 12/18/90, effective 7/1/91.]

WAC 51-13-302 Minimum ventilation criteria for all Group R occupancies four stories and less.

302.1 General: This section shall apply to all Group R occupancies four (4) stories and less as defined by the Washington State Building Code. Residential structures greater than four (4) stories in height shall comply with Section 304, for outdoor air supply requirements. For source specific ventilation requirements, see Section 302.2.1. Compliance with this section shall be demonstrated through engineering calculations or performance testing. Documentation of calculations shall be submitted to the building official where required. Performance testing shall be conducted in accordance with recognized test methods.

302.1.2 Testing: At the discretion of the building official, flow testing may be required to verify that the mechanical system(s) satisfies the requirements of this section. Flow testing may be performed using flow hoods measuring at the intake or exhaust points of the system, in-line pitot tube, or pitot-traverse type measurement systems in the duct, short term tracer gas measurements, or other means approved by the building official.

302.2 Minimum Ventilation Performance: Each dwelling unit or guest room shall be equipped with source specific and whole house ventilation systems designed and installed to satisfy the ventilation requirements of this chapter.

EXCEPTION: All public corridors shall meet the ventilation requirements in section 1203.3 of the Uniform Building Code.

302.2.1 Source Specific Ventilation: Source specific exhaust ventilation shall be required in each kitchen, bathroom, water closet, laundry room, indoor swimming pool, spa, and other rooms where excess water vapor or cooking odor is produced.

The minimum source specific ventilation effective exhaust capacity shall be not less than levels specified in Table 3-1.

302.2.2 Whole House Ventilation Systems: Each dwelling unit shall be equipped with a whole house ventilation system which shall be capable of providing at least 0.35 air changes per hour, but not less than fifteen cubic feet per minute per bedroom plus an additional fifteen cubic feet per minute. Whole house ventilation systems shall be designed to limit ventilation to a level no greater than 0.5 air changes per hour under normal operation conditions. Whole house ventilation systems shall supply outdoor air to all habitable rooms through individual outdoor air inlets, forced-air heating system, ducting or equivalent means. Doors and operable lites in windows are deemed not to meet the outdoor air supply intake requirements.

EXCEPTION: For dwelling units of no more than 1,400 square feet, the maximum ventilation rate shall be 0.65 air changes per hour.

302.3 Controls: All ventilation system controls shall be readily accessible. Controls for whole house ventilation systems shall be capable of operating the ventilation system without energizing other energy-consuming appliances.

EXCEPTION: Continuously operated whole house ventilation systems switch shall not be readily accessible by the occupant.

302.3.1 Source Specific Ventilation Systems: Source specific ventilation systems shall be controlled by manual switches, dehumidistats, timers, or other approved means.

302.3.2 Intermittently Operated Whole House Ventilation Systems: The intermittently operated whole house ventilation systems shall be constructed to have the capability for continuous operation, and shall have a manual control and an automatic control, such as a clock timer. At the time of final inspection, the automatic control timer shall be set to operate the whole house fan for a minimum of eight hours a day.

302.4 Noise: Whole house fans located four feet or less from the interior grille shall have a sone rating of 1.5 or less measured at 0.1 inches water gauge. Remotely mounted fans shall be acoustically isolated from the structural elements of the building and from attached duct work using insulated flexible duct or other approved material.

EXCEPTION: Whole house ventilation systems which are integrated with forced-air heating systems or heat-recovery ventilation systems are exempt from the sone rating requirements of this section.

302.5 Ventilation Ducts: All ducts shall terminate outside the building. Exhaust ducts in systems which are designed to operate intermittently shall be equipped with back-draft dampers. All exhaust ducts in unconditioned spaces shall be insulated to a minimum of R-4. All supply ducts in the conditioned space shall be insulated to a minimum of R-4.

302.6 Outdoor Air: A mechanical system shall supply outdoor air as required in section 302.2.2. The mechanical system may consist of exhaust fans, supply fans, or both.

302.6.1 Outdoor Air Inlets: Inlets shall be screened or otherwise protected from entry by insects, leaves, or other material. Outdoor air inlets shall be located so as not to take air from the following areas:

a) Closer than ten feet from an appliance vent outlet, unless such vent outlet is three feet above the outdoor air inlet.

b) Where it will pick up objectionable odors, fumes, or flammable vapors.

c) A hazardous or unsanitary location.

d) A room or space having any fuel-burning appliances therein.

e) Closer than ten feet from a vent opening of a plumbing drainage system unless the vent opening is at least three feet above the air inlet.

f) Attic, crawl spaces, garages.

302.6.2 Individual Room Outdoor Air Inlets: Individual room outdoor air inlets shall:

a) have controllable and secure openings;

b) be sleeved or otherwise designed so as not to compromise the thermal properties of the wall or window in which they are placed;

c) provide not less than four square inches of net free area of opening for each habitable space. Any inlet or combination of inlets which provide 10 cfm at 10 Pascals as determined by the Home Ventilating Institute Air Flow Test Standard are deemed equivalent to four square inches net free area.

302.6.3 Ventilation Integrated with Forced-Air Systems: The outdoor air connection to the return air stream shall be located upstream of the forced-air system blower and shall not be connected directly into a furnace cabinet to prevent thermal shock to the heat exchanger.

302.6.4 Distribution: Outdoor air shall be distributed to each habitable room by individual inlets, separate duct systems, or a forced-air system. Where outdoor air supplies are separated from exhaust points by doors, provisions shall be made to ensure air flow by installation of distribution ducts, undercutting doors, installation of grilles, transoms, or similar means where permitted by the Uniform Building Code. Doors shall be undercut to a minimum of one-half inch above the surface of the finish floor covering.

[Statutory Authority: RCW 19.27.190. 95-01-128, § 51-13-302, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-302, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-302, filed 12/18/90, effective 7/1/91.]

WAC 51-13-303 Mechanical ventilation criteria and minimum ventilation prescriptive requirements for all Group R occupancies four stories and less.

303.1 General: This section establishes minimum prescriptive design requirements for intermittently operated systems. Continuously operated systems shall comply with section 302. System characteristics not addressed in the following sections shall comply with section 302. A system which meets the requirements of this section shall be deemed to satisfy the requirements of this chapter.

303.1.1 Source Specific: Exhaust fans providing source specific ventilation shall have a minimum fan flow rating not less than fifty cfm at 0.25 inches water gauge for bathrooms, laundries, or similar rooms and one hundred cfm at 0.25 inches water gauge for kitchens. Manufacturers' fan flow ratings shall be determined as per HVI 916 (July 1989) or AMCA 210.

EXCEPTION: Where a range hood or down draft exhaust fan is used to satisfy the source specific ventilation requirements for kitchens, the range hood or down draft exhaust shall not be less than 100 CFM at 0.10 inches water gauge.

303.1.2 Whole House: Whole house ventilation systems may consist of whole house exhaust, integration with forced-air systems or dedicated heat recovery ventilation systems. Whole house ventilation systems shall provide ventilation capacity as specified in Table 3-2 and meet the following requirements:

a) Exhaust fans providing whole house ventilation shall have a flow rating at 0.25 inches water gauge as specified in Table 3-2. Manufacturer's fan flow ratings shall be determined as per HVI 916 (July 1989) or AMCA 210. Table 3-2 shall not be used for dwelling units with more than five bedrooms.

b) Integrated forced-air ventilation systems shall have an outdoor air inlet duct connecting a terminal element on the outside of the building to the return air plenum of the forced-air system, at a point within 4 feet upstream of the air handler, and be equipped with one of the following:

1) A motorized damper connected to the automatic ventilation control as specified in Section 302.3.2; or

2) A damper installed and set to meet measured flow rates as specified in Table 3-2, by either field testing or following manufacturer's installation instructions based on site conditions; or

3) An automatic flow regulated device with field measured or field calculated minimum negative pressure differential of 0.07 inches water gauge at the point where the outside air duct is connected to the return air plenum.

c) Heat recovery ventilation systems: All duct work in heat recovery ventilation systems shall be not less than six inch diameter. Balancing dampers shall be installed on the inlet and exhaust side. Flow measurement grids shall be installed on the supply and return. System minimum flow rating shall be not less than that specified in Table 3-2. Maximum flow rates in Table 3-2 do not apply to heat recovery ventilation systems.

303.2 Source specific and whole house ventilation ducts: Exhaust ducts shall meet all requirements of section 302.5. Duct diameter, length, and number of elbows for exhaust fans shall be as specified in Table 3-3. Terminal elements for exhaust fan duct systems shall have at least the equivalent net free area of the duct work. Duct diameter, length, and number of elbows for integrated forced air systems shall be as specified in Table 3-5. Terminal elements for integrated systems shall be the same size as the connecting ductwork or 8 inches in diameter whichever is greater.

[Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-303, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-303, filed 12/18/90, effective 7/1/91.]

WAC 51-13-304 Mechanical ventilation criteria and minimum ventilation performance for all other occupancies not covered in sections 302 and 303.

304.1 Ventilation: The minimum requirements for operable area to provide natural ventilation are specified in the Uniform Building Code (UBC) as adopted by the state of Washington.

Where a mechanical ventilation system is installed, the mechanical ventilation system shall be capable of supplying ventilation air to each zone with the minimum outdoor air quantities specified in Table 3-4.

EXCEPTION: Where occupancy density is known and documented in the plans, the outside air rate may be based on the design occupant density. Under no circumstance shall the occupancies used result in outside air less than one-half that resulting from application of Table 3-4 estimated maximum occupancy values.

The outdoor air shall be ducted in a fully enclosed path directly to every air handling unit in each zone not provided with sufficient operable area for natural ventilation.

EXCEPTION: Ducts may terminate within 12 inches of the intake to an HVAC unit provided they are physically fastened so that the outside air duct is directed into the unit intake.

In all parking garages, other than open parking garages as defined in UBC 311.9, used for storing or handling of automobiles operating under their own power and on all loading platforms in bus terminals, ventilation shall be provided at 1.5 cfm per square foot of gross floor area. The building official may approve an alternate ventilation system designed to exhaust a minimum fourteen thousand cfm for each operating vehicle. Such system shall be based on the anticipated instantaneous movement rate of vehicles but not less than 2.5 percent (or one vehicle) of the garage capacity. Automatic carbon monoxide sensing systems may be submitted for approval.

In all buildings used for the repair of automobiles, each repair stall shall be equipped with an exhaust extension duct, extending to the outside of the building, which if over ten feet in length, shall mechanically exhaust three hundred cfm. Connecting offices and waiting rooms shall be supplied with conditioned air under positive pressure.

Combustion air requirements shall conform to the requirements of Chapter 7 of the UMC.

Mechanical refrigerating equipment and rooms storing refrigerants shall conform to the requirements of Chapter 11 of the UMC.

TABLE 3-1
Minimum Source Specific Ventilation Capacity Requirements

	Bathrooms	Kitchens
Intermittently operating	50 cfm	100 cfm
Continuous operation	20 cfm	25 cfm

TABLE 3-2
Whole House Ventilation Flow Requirements[1]

	CFM	
Bedrooms	Minimum	Maximum
2 or less	50	75
3	80	120
4	100	150
5	120	180

1. This table shall not be used for dwelling units containing more than 5 bedrooms.

TABLE 3-3
Prescriptive Exhaust Duct Sizing

Fan Tested CFM @0.25 W.G.	Minimum Flex Diameter	Maximum Length Feet	Minimum Smooth Diameter	Maximum Length Feet	Maximum Elbows[1]
50	4 inch	25	4 inch	70	3
50	5 inch	90	5 inch	100	3
50	6 inch	No Limit	6 inch	No Limit	3
80	4 inch[2]	NA	4 inch	20	3
80	5 inch	15	5 inch	100	3
80	6 inch	90	6 inch	No Limit	3
100	5 inch[2]	NA	5 inch	50	3
100	6 inch	45	6 inch	No Limit	3
125	6 inch	15	6 inch	No Limit	3
125	7 inch	70	7 inch	No Limit	3

1. For each additional elbow subtract 10 feet from length.
2. Flex ducts of this diameter are not permitted with fans of this size.

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PRESCRIPTIVE EXHAUST DUCT SIZING
TABLE 3-3

Fan Tested CFM @0.25 W.G.	Minimum Flex Diameter	Maximum Length Feet	Minimum Smooth Diameter	Maximum Length Feet	Maximum Elbows[1]
50	4 inch	25	4 inch	70	3
50	5 inch	90	5 inch	100	3
50	6 inch	No Limit	6 inch	No Limit	3
80	4 inch[2]	NA	4 inch	20	3
80	5 inch	15	5 inch	100	3
80	6 inch	90	6 inch	No Limit	3
100	5 inch[2]	NA	5 inch	50	3
100	6 inch	45	6 inch	No Limit	3
125	6 inch	15	6 inch	No Limit	3
125	7 inch	70	7 inch	No Limit	3

[1] For each additional elbow subtract 10 feet from length.

[2] Flex ducts of this diameter are not permitted with fans of this size.

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TABLE 3-4
OUTDOOR AIR REQUIREMENTS FOR VENTILATION[1]
OCCUPANCIES NOT SUBJECT TO SECTION 302

Application	Estimated Maximum[2] Occupancy P/1000 ft² or 100 m²	Outdoor Air Requirements cfm/person
Dry Cleaners, Laundries[3]		cfm/person
Commercial laundry	10	25
Commercial dry cleaner	30	30
Storage, pick up	30	35
Coin-operated laundries	20	15
Coin-operated dry cleaner	20	15
Dwelling Units In Buildings Greater Than Four Stories or Attached to I-Occupancy Facilities		
Bedrooms & living areas[24]		15
Food and Beverage Service		
Dinning rooms	70	20
Cafeteria, fast food	100	20
Bars, cocktail lounges[4]	100	30
Kitchens(cooking)[23]	20	15
Garages, Repair, Service Stations		
Enclosed parking garage[5]		1.50 cfm/ft.sq.
Auto repair rooms		1.50 cfm/ft.sq.
Hotels, Motels, Resorts, Congregate Residences with More Than Four Stories[6]		
Bedrooms		30 cfm/room
Living Rooms		30 cfm/room
Bath[7]		35 cfm/room
Lobbies	30	15
Conference rooms	50	20
Assembly rooms	120	15
Gambling casinos[4]	120	30
Offices		
Office space[9]	7	20
Reception area	60	15
Telecommunication centers and data entry areas	60	20
Conference rooms	50	20

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TABLE 3-4 Cont.
OUTDOOR AIR REQUIREMENTS FOR VENTILATION[1]
OCCUPANCIES NOT SUBJECT TO SECTION 302

Application	Estimated Maximum[2] Occupancy P/1000 ft² or 100 m²	Outdoor Air Requirements cfm/person
Public Spaces		
Corridors and utilities		0.05 cfm/ft.sq.
Public restroom, cfm/wc or urinal[10]		50
Lockers and dressing rooms		0.5 cfm/ft.sq.
Smoking lounge[11]	70	60
Elevators[12]		1.0 cfm/ft.sq.
Retail Stores, Sales Floors, and Show Room Floors		
Basement and street	30	0.3 cfm/ft.sq.
Upper floors	20	0.2 cfm/ft.sq.
Storage rooms	15	0.15 cfm/ft.sq.
Dressing rooms		0.20 cfm/ft.sq.
Malls and arcades	20	0.20 cfm/ft.sq.
Shipping and receiving	10	0.15 cfm/ft.sq.
Warehouses	5	0.05 cfm/ft.sq.
Smoking lounge[11]	70	60
Specialty Shops		
Barber	25	15
Beauty	25	25
Reducing salons	20	15
Florists[13]	8	15
Clothiers, furniture		0.30 cfm/ft.sq.
Hardware, drugs, fabric	8	15
Supermarkets	8	15
Pet shops		1.00 cfm/ft.sq.
Sports and Amusement[14]		
Spectator areas	150	15
Game rooms	70	25
Ice arenas(playing areas)		0.50 cfm/ft.sq
Swimming Pools(pool and deck area)[15]		0.50 cfm/ft.sq.
Playing floor(gymnasium)	30	20
Ballrooms and discos	100	25
Bowling alleys(seating areas)	70	25
Theaters[16]		
Ticket booths	60	20
Lobbies	150	20
Auditorium	150	20
Stages, studios	70	15

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TABLE 3-4 Cont.
OUTDOOR AIR REQUIREMENTS FOR VENTILATION[1]
OCCUPANCIES NOT SUBJECT TO SECTION 302

Application	Estimated Maximum[2] Occupancy P/1000 ft² or 100 m²	Outdoor Air Requirements cfm/person
Transportation[17]		
Waiting rooms	100	15
Platforms	100	15
Vehicles	150	15
Workrooms		
Meat processing[18]	10	15
Photo studios	10	15
Darkrooms	10	0.50 cfm/ft.sq.
Pharmacy	20	15
Bank vaults	5	15
Duplicating, printing[19]		0.50 cfm/ft.sq.
INSTITUTIONAL FACILITIES		
Education		
Classroom	50	15
Laboratories[20]	30	20
Training shop	30	20
Music rooms	50	15
Libraries	20	15
Locker rooms		0.50 cfm/ft.sq.
Corridors		0.10 cfm/ft.sq.
Auditoriums	150	15
Smoking lounges[11]	70	60
Hospitals, Nursing and Convalescent Homes		
Patient rooms[21]	10	25
Medical procedure	20	15
Operating rooms	20	30
Recovery and ICU	20	15
Autopsy rooms[22]		0.50 cfm/ft.sq.
Physical Therapy	20	15
Correctional Facilities		
Cells	20	20
Dining halls	100	15
Guard station	40	15

1. Derived from ASHRAE Standard 62-1989.
2. Net occupiable space
3. Dry-cleaning process may require more air.
4. Supplementary smoke-removal equipment may be required.
5. Distribution among people must consider worker location and concentration of running engine; stands where engine are run must incorporate systems for positive engine exhaust withdrawal. Contaminant sensors may be used to control ventilation.
6. Independent of room size.
7. Installed capacity for intermittent use.
8. See also food and beverage service, merchandising, barber and beauty shops, garages.
9. Some office equipment may require local exhaust.
10. Mechanical exhaust with no recirculation is recommended.
11. Normally supplied by transfer air, local mechanical exhaust; with no recirculation recommended.
12. Normally supplied by transfer air.
13. Ventilation to optimize plant growth may dictate requirements.
14. When internal combustion engines are operated for maintenance of playing surfaces, increased ventilation rates may be required.
15. Higher values may be required for humidity control.
16. Special ventilation will be needed to eliminate special stage effects.
17. Ventilation within vehicles may require special considerations.
18. Spaces maintained at low temperatures(-10°F. to +50°F.) are not covered by these requirements unless the occupancy is continuous. Ventilation from adjoining spaces is permissible. When the occupancy is intermittent, infiltration will normally exceed the ventilation requirements.
19. Installed equipment must incorporate positive exhaust and control of undesirable contaminants.
20. Special contamination control systems may be required for processes or functions including laboratory animal occupancy.
21. Special requirements or codes and pressure relationships may determine minimum ventilation rates and filter efficiency. Procedures generating contaminants may require higher rates.
22. Air shall not be recirculated into other spaces.
23. Makeup air for hood exhaust may require more ventilating air.
24. Occupant loading shall be based on the number of bedrooms as follows: first bedroom, two persons; each additional bedroom, one person. Where higher occupant loadings are known, they shall be used.

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TABLE 3-4
Outdoor Air Requirements for Ventilation[1]
Occupancies not Subject to Sections 302 and 303

Application	Estimated Maximum[2] Occupancy P/1000 ft^2 or 100 m^2	Outdoor Air Requirements cfm/person
Dry Cleaners, Laundries[3]		
Commercial laundry	10	25
Commercial dry cleaner	30	30
Storage, pick up	30	35
Coin-operated laundries	20	15
Coin-operated dry cleaner	20	15
Dwelling Units In Buildings Greater Than Four Stories or Attached to I-Occupancy Facilities		
Bedrooms & living areas[24]		15
Food and Beverage Service		
Dinning rooms	70	20
Cafeteria, fast food	100	20
Bars, cocktail lounges[4]	100	30
Kitchens(cooking)[23]	20	15
Garages, Repair, Service Stations		
Enclosed parking garage[5]		1.50 cfm/ft.sq.
Auto repair rooms		1.50 cfm/ft.sq.
Hotels, Motels, Resorts, Congregate Residences with More Than Four Stories[6]		
Bedrooms		30 cfm/room
Living Rooms		30 cfm/room
Bath[7]		35 cfm/room
Lobbies	30	15
Conference rooms	50	20
Assembly rooms	120	15
Gambling casinos[4]	120	30
Offices		
Office space[9]	7	20
Reception area	60	15
Telecommunication centers and data entry areas	60	20
Conference rooms	50	20
Public Spaces		
Corridors and utilities		0.05 cfm/ft.sq.
Public restroom, cfm/wc or urinal[10]		50
Lockers and dressing rooms		0.50 cfm/ft.sq.
Smoking lounge[11]	70	60
Elevators[12]		1.0 cfm/ft.sq.

TABLE 3-4 Cont.
Outdoor Air Requirements for Ventilation[1]
Occupancies not Subject to Sections 302 and 303

Application	Estimated Maximum[2] Occupancy P/1000 ft^2 or 100 m^2	Outdoor Air Requirements . cfm/person
Retail Stores, Sales Floors, and Show Room Floors		
Basement and street	30	0.30 cfm/ft.sq.
Upper floors	20	0.20 cfm/ft.sq.
Storage rooms	15	0.15 cfm/ft.sq.
Dressing rooms		0.20 cfm/ft.sq.
Malls and arcades	20	0.20 cfm/ft.sq.
Shipping and receiving	10	0.15 cfm/ft.sq.
Smoking lounge[11]	70	60
Warehouses	5	0.05 cfm/ft.sq.
Specialty Shops		
Barber	25	15
Beauty	25	25
Reducing salons	20	15
Florists[13]	8	15
Clothiers, furniture		0.30 cfm/ft.sq.
Hardware, drugs, fabric	8	15
Supermarkets	8	15
Pet shops		1.00 cfm/ft.sq.
Sports and Amusement[14]		
Spectator areas	150	15
Game rooms	70	25
Ice arenas(playing areas)		0.50 cfm/ft.sq.
Swimming Pools(pool and deck area)[15]		0.50 cfm/ft.sq.
Playing floor(gymnasium)	30	20
Ballrooms and discos	100	25
Bowling alleys(seating areas)	70	25
Theaters[16]		
Ticket booths	60	20
Lobbies	150	20
Auditorium	150	15
Stages, studios	70	15
Transportation[17]		
Waiting rooms	100	15
Platforms	100	15
Vehicles	150	15
Workrooms		
Meat processing[18]	10	15
Photo studios	10	15
Darkrooms	10	0.50 cfm/ft.sq.
Pharmacy	20	15
Bank vaults	5	15
Duplicating, printing[19]		0.50 cfm/ft.sq.

TABLE 3-4
Outdoor Air Requirements for Ventilation[1]
Occupancies not Subject to Sections 302 and 303

Application	Estimated Maximum[2] Occupancy P/1000 ft^2 or 100 m^2	Outdoor Air Requirements cfm/person
INSTITUTIONAL FACILITIES		
Education		
Classroom	50	15
Laboratories[20]	30	20
Training shop	30	20
Music rooms	50	15
Libraries	20	15
Locker rooms		0.50 cfm/ft.sq.
Corridors		0.10 cfm/ft.sq.
Auditoriums	150	15
Smoking lounges[11]	70	60
Hospitals, Nursing and Convalescent Homes		
Patient rooms[21]	10	25
Medical procedure	20	15
Operating rooms	20	30
Recovery and ICU	20	15
Autopsy rooms[22]		0.50 cfm/ft.sq.
Physical Therapy	20	15
Correctional Facilities		
Cells	20	20
Dining halls	100	15
Guard station	40	15

Table 3-4 Cont.
Outdoor Air Requirements for Ventilation[1]
Occupancies not Subject to Sections 302 and 303

1. Derived from ASHRAE Standard 62-1989.
2. Net occupiable space.
3. Dry-cleaning process may require more air.
4. Supplementary smoke-removal equipment may be required.
5. Distribution among people must consider worker location and concentration of running engine; stands where engines are run must incorporate systems for positive engine exhaust withdrawal. Contaminant sensors may be used to control ventilation.
6. Independent of room size.
7. Installed capacity for intermittent use.
8. See also food and beverage service, merchandising, barber and beauty shops, garages.
9. Some office equipment may require local exhaust.
10. Mechanical exhaust with no recirculation is recommended.
11. Normally supplied by transfer air, local mechanical exhaust; with no recirculation recommended.
12. Normally supplied by transfer air.
13. Ventilation to optimize plant growth may dictate requirements.
14. When internal combustion engines are operated for maintenance of playing surfaces, increased ventilation rates may be required.
15. Higher values may be required for humidity control.
16. Special ventilation will be needed to eliminate special stage effects.
17. Ventilation within vehicles may require special considerations.
18. Spaces maintained at low temperatures(-10°F. to +50°F.) are not covered by these requirements unless the occupancy is continuous. Ventilation from adjoining spaces is permissible. When the occupancy is intermittent, infiltration will normally exceed the ventilation requirements.
19. Installed equipment must incorporate positive exhaust and control of undesirable contaminants.
20. Special contamination control systems may be required for processes or functions including laboratory animal occupancy.
21. Special requirements or codes and pressure relationships may determine minimum ventilation rates and filter efficiency. Procedures generating contaminants may require higher rates.
22. Air shall not be recirculated into other spaces.
23. Makeup air for hood exhaust may require more ventilating air.
24. Occupant loading shall be based on the number of bedrooms as follows: first bedroom, two persons; each additional bedroom, one person. Where higher occupant loadings are known, they shall be used.

TABLE 3-5
Prescriptive Integrated Forced Air Supply Duct Sizing

Number of Bedrooms	Minimum Smooth Duct Diameter	Minimum Flexible Duct Diameter	Maximum Length[1]	Maximum Number of Elbows[2]
2 or less	6"	7"	20'	3
3	7"	8"	20'	3
4 or more	8"	9"	20'	3

1. For lengths over 20 feet increase duct diameter 1 inch.
2. For elbows numbering more than 3 increase duct diameter 1 inch.

[Statutory Authority: RCW 19.27.190. 95-01-128, § 51-13-304, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-304, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-304, filed 12/18/90, effective 7/1/91.]

Reviser's note: RCW 34.05.395 requires the use of underlining and deletion marks to indicate amendments to existing rules, and deems ineffectual changes not filed by the agency in this manner. The bracketed material in the above section does not appear to conform to the statutory requirement.

WAC 51-13-400 Chapter 4—Indoor air quality.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-400, filed 12/18/90, effective 7/1/91.]

WAC 51-13-401 Pollutant source control.

401.1 Formaldehyde Reduction Measures: All structural panel components within the conditioned space such as plywood, particle board, wafer board, and oriented strand board shall be identified as "EXPOSURE 1," "EXTERIOR" or "HUD-APPROVED."

[Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-401, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-401, filed 12/18/90, effective 7/1/91.]

WAC 51-13-402 Solid fuel burning appliances and fireplaces.

402.1 General: Solid fuel burning appliances and fireplaces shall satisfy one of the following criteria.

402.2 Solid Fuel Burning Appliances: Solid fuel burning appliances shall be provided with the following:

a) Tight fitting metal or ceramic glass doors.

b) 1. A source from outside the structure of primary combustion air, connected to the appliance as per manufacturer's specification. The air inlet shall originate at a point below the fire box. The duct shall be 4 inches or greater in diameter, not exceed 20 feet in length, and be installed as per manufacturer's instructions;

or

2. The appliance and manufacturer's recommended combustion air supply, as an installed unit, shall be certified by an independent testing laboratory to have passed Test No. 11 - Negative Pressure Test, Section 12.3, of ULC S627-M1984 "Space Heaters for Use with Solid Fuels," modified as follows:

A) Negative pressure of 8 Pascal shall be initially established with the chamber sealed and the air supply, if not directly connected to the appliance, closed off.

B) The air supply, if not directly connected to the appliance, shall then be opened.

C) The maximum allowable air exchange rate from chamber leakage and intentional air supply for the unit (appliance with combustion air supply) in the test chamber is 3.5 air changes per hour, or 28 cfm (cubic feet of air per minute), whichever is less.

EXCEPTION: Combustion air may be supplied to the room in which the solid fuel burning appliance is located in lieu of direct ducting, provided that one of the following conditions is met:

1) The solid fuel burning appliance is part of a central heating plant and installed in an unconditioned space in conformance with the Uniform Mechanical Code; or

2) The solid fuel burning appliance is installed in existing construction directly on a concrete floor or surrounded by masonry materials as in a fireplace.

The combustion air terminus shall be located as close to the solid fuel burning appliance as possible and shall be provided with a barometric damper or equivalent. The combustion air source shall be specified by the manufacturer or no less than four (4) inches in diameter or the equivalent in area or as approved.

402.3 Fireplaces: Fireplaces shall be provided with each of the following:

a) Tightly fitting flue dampers, operated by a readily accessible manual or approved automatic control.

EXCEPTION: Fireplaces with gas logs shall be installed in accordance with the Uniform Mechanical Code section 901.

b) An outside source for combustion air ducted into the firebox. The duct shall be at least six (6) square inches, and shall be provided with an operable outside air duct damper.

c) Site built fireplaces shall have tight fitting glass or metal doors, or a flue draft induction fan, or as approved for

minimizing back-drafting. Factory built fireplaces shall use doors listed for the installed appliance.

402.4 Masonry Heaters: Masonry heaters shall be approved by the department of ecology and shall contain both of the following:

a) Primary combustion air ducted from the outside of the structure to the appliance.

b) Tight fitting ceramic glass or metal doors. Flue damper, when provided, shall have an external control and when in the closed position shall have a net free area of not less than five percent of the flue cross sectional area.

[Statutory Authority: RCW 19.27.190. 95-01-128, § 51-13-402, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-402, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-402, filed 12/18/90, effective 7/1/91.]

WAC 51-13-500 Chapter 5—Radon resistive construction standards.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-500, filed 12/18/90, effective 7/1/91.]

WAC 51-13-501 Scope.

501.1 General: The criteria of this chapter establishes minimum radon resistive construction requirements for all Group R Occupancies. These requirements are adopted pursuant to the ventilation requirements of Section 7, of Chapter 2 of the Session Laws of 1990.

501.2 Application: The requirements of this chapter shall be adopted and enforced by all jurisdictions of the state according to the following subsections:

501.2.1: All jurisdictions of the state shall comply with section 502.

501.2.2: Ferry, Okanogan, Pend Oreille, Skamania, Spokane, and Stevens counties shall also comply with section 503.

[Statutory Authority: RCW 19.27.190. 95-01-128, § 51-13-501, filed 12/21/94, effective 6/30/95; 91-01-102, § 51-13-501, filed 12/18/90, effective 7/1/91.]

WAC 51-13-502 State-wide radon requirements.

502.1 Crawlspaces:

502.1.1 General: All crawlspaces shall comply with the requirements of this section.

502.1.2 Ventilation: All crawlspaces shall be ventilated as specified in section 2317.7 of the Washington State Uniform Building Code (chapter 51-30 WAC).

If the installed ventilation in a crawlspace is less than one square foot for each three hundred square feet of crawlspace area, or if the crawlspace vents are equipped with operable louvers, a radon vent shall be installed to originate from a point between the ground cover and soil. The radon vent shall be installed in accordance with sections 503.2.6 and 503.2.7.

502.1.3 Crawlspace Plenum Systems: In crawlspace plenum systems used for providing supply air for an HVAC system, aggregate, a permanently sealed soil gas retarder membrane and a radon vent pipe shall be installed in accordance with section 503.2. Crawlspaces shall not be used for return air plenums.

In addition, an operable radon vent fan shall be installed. The fan shall be located as specified in section 503.2.7. The fan shall be capable of providing at least one hundred cfm at one inch water column static pressure. The fan shall be controlled by a readily accessible manual switch. The switch shall be labeled "RADON VENT FAN."

[Statutory Authority: RCW 19.27.190. 95-01-128, § 51-13-502, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-502, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-12-045, § 51-13-502, filed 6/5/91, effective 7/1/91; 91-01-102, § 51-13-502, filed 12/18/90, effective 7/1/91.]

WAC 51-13-503 Radon prescriptive requirements.

503.1 Scope: This section applies to those counties specified in section 501.2.2. This section establishes prescriptive construction requirements for reducing the potential for radon entry into all Group R occupancies, and for preparing the building for future mitigation if desired.

In all crawlspaces, except crawlspace plenums used for providing supply air for an HVAC system, a continuous air barrier shall be installed between the crawlspace area and the occupied area to limit air transport between the areas. If a wood sheet subfloor or other material is utilized as an air barrier, in addition to the requirements of section 502.1.6.2 of the Washington state energy code, all joints between sheets shall be sealed.

503.2 Floors in Contact with the Earth

503.2.1 General: Concrete slabs that are in direct contact with the building envelope shall comply with the requirements of this section.

EXCEPTION: Concrete slabs located under garages or other than Group R occupancies need not comply with this chapter.

503.2.2 Aggregate: A layer of aggregate of four inch minimum thickness shall be placed beneath concrete slabs. The aggregate shall be continuous to the extent practical.

503.2.3 Gradation: Aggregate shall:

a) Comply with ASTM Standard C-33 Standard Specification for Concrete Aggregate and shall be size No. 67 or larger size aggregate as listed in Table 2, Grading Requirements for Coarse Aggregate; or

b) Meet the 1988 Washington State Department of Transportation specification 9-03.1 (3) "Coarse Aggregate for Portland Cement Concrete", or any equivalent successor standards. Aggregate size shall be of Grade 5 or larger as listed in section 9-03.1 (3) C, "Grading"; or

c) Be screened, washed, and free of deleterious substances in a manner consistent with ASTM Standard C-33 with one hundred percent of the gravel passing a one inch sieve and less than two percent passing a four-inch sieve. Sieve characteristics shall conform to those acceptable under ASTM Standard C-33.

EXCEPTION: Aggregate shall not be required if a substitute material or system, with sufficient load bearing characteristics, and having approved capability to provide equal or superior air flow, is installed.

503.2.4 Soil-Gas Retarder Membrane: A soil-gas retarder membrane, consisting of at least one layer of virgin polyethylene with a thickness of at least six mil, or equivalent flexible sheet material, shall be placed directly under all concrete slabs so that the slab is in direct contact with the membrane. The flexible sheet shall extend to the foundation wall or to the outside edge of the monolithic slab. Seams shall overlap at least twelve inches.

EXCEPTION: If the membrane is not in direct contact with the bottom of the concrete slab, all overlapping seams shall be sealed with an approved tape or sealant, and the material shall be sealed to the foundation wall in a permanent manner. The membrane shall also be fitted tightly to all pipes, wires, and other penetrations of the membrane and sealed with an approved sealant or tape. All punctures or tears shall be repaired with the same or approved material and similarly lapped and sealed. In no case shall the membrane be installed below the aggregate.

503.2.5 Sealing of Penetrations and Joints: All penetrations and joints in concrete slabs or other floor systems and walls below grade shall be sealed by an approved sealant to create an air barrier to limit the movement of soil-gas into the indoor air.

Sealants shall be approved by the manufacturer for the intended purpose. Sealant joints shall conform to manufacturer's specifications. The sealant shall be placed and tooled in accordance with manufacturer's specifications. There shall be no gaps or voids after the sealant has cured.

503.2.6 Radon Vent: One continuous sealed pipe shall run from a point within the aggregate under each concrete slab to a point outside the building. Joints and connections shall be permanently gas tight. The continuous sealed pipe shall interface with the aggregate in the following manner, or by other approved equal method: The pipe shall be permanently connected to a "T" within the aggregate area so that the two end openings of the "T" lie within the aggregate area. A minimum of five feet of perforated drain pipe of three inches minimum diameter shall join to and extend from the "T." The perforated pipe shall remain in the aggregate area and shall not be capped at the ends. The "T" and it's perforated pipe extensions shall be located at least five feet horizontally from the exterior perimeter of the aggregate area.

The continuous sealed pipe shall terminate no less than twelve inches above the eave, and more than ten horizontal feet from a woodstove or fireplace chimney, or operable window. The continuous sealed pipe shall be labeled "radon vent." The label shall be placed so as to remain visible to an occupant.

The minimum pipe diameter shall be three inches unless otherwise approved. Acceptable sealed plastic pipe shall be smooth walled, and may include either PVC schedule 40 or ABS schedule of equivalent wall thickness.

The entire sealed pipe system shall be sloped to drain to the sub-slab aggregate.

The sealed pipe system may pass through an unconditioned attic before exiting the building; but to the extent practicable, the sealed pipe shall be located inside the thermal envelope of the building in order to enhance passive stack venting.

EXCEPTION: A fan forced sub-slab depressurization system includes:

1) Soil-gas retarder membrane as specified in section 503.2.4;

2) Sealing of penetrations and joints as specified in section 503.2.5;

3) A three-inch continuous sealed radon pipe shall run from a point within the aggregate under each concrete slab to a point outside the building;

4) Joints and connections may be gas tight, and may be of either PVC schedule 40 or ABS schedule of equivalent in wall thickness;

5) A label of "radon vent" shall be placed on the pipe so as to remain visible to the occupant;

6) Fan circuit and wiring as specified in section 503.2.7 and a fan.

If the sub-slab depressurization system is exhausted through the concrete foundation wall or rim joist, the exhaust terminus shall be a minimum of six feet from operable windows or outdoor air intake vents and shall be directed away from operable windows and outdoor air intake vents to prevent radon re-entrainment.

503.2.7 Fan Circuit and Wiring and Location: An area for location of an in-line fan shall be provided. The location shall be as close as practicable to the radon vent pipe's point of exit from the building, or shall be outside the building shell; and shall be located so that the fan and all downstream piping is isolated from the indoor air.

Provisions shall be made to allow future activation of an in-line fan on the radon vent pipe without the need to place new wiring. A one hundred ten volt power supply shall be provided at a junction box near the fan location.

503.2.8 Separate Aggregate Areas: If the four-inch aggregate area underneath the concrete slab is not continuous, but is separated into distinct isolated aggregate areas by a footing or other barrier, a minimum of one radon vent pipe shall be installed into each separate aggregate area.

EXCEPTION: Separate aggregate areas may be considered a single area if a minimum three-inch diameter connection joining the separate areas is provided for every thirty feet of barrier separating those areas.

503.2.9 Concrete Block Walls: Concrete block walls connected to below grade areas shall be considered unsealed surfaces. All openings in concrete block walls that will not remain accessible upon completion of the building shall be sealed at both vertical and horizontal surfaces, in order to create a continuous air barrier to limit the transport of soil-gas into the indoor air.

[Statutory Authority: RCW 19.27.190(2) and 1992 c 132. 93-02-056, § 51-13-503, filed 1/6/93, effective 7/1/93. Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-503, filed 12/18/90, effective 7/1/91.]

Chapter 51-16 WAC
STATE BUILDING CODE GUIDELINES

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

51-16-040 Uniform Mechanical Code. [Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-040, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-040, filed 11/26/85, effective 6/11/86.] Repealed by 92-01-069, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139.

51-16-050 Uniform Fire Code and Uniform Fire Code Standards. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-16-050, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074. 88-24-018 and 89-11-081 (Orders 88-11 and 88-11A), § 51-16-050, filed 12/1/88 and 5/23/89, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-050, filed 11/26/85, effective 6/11/86.] Repealed by 92-01-069, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139.

51-16-060 Uniform Plumbing Code and Uniform Plumbing Code standards. [Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-060, filed 12/1/88, effective 7/1/89; 86-24-041 (Order 86-19), § 51-16-060, filed 11/26/86, effective 4/27/87. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-060, filed 11/26/85, effective 6/11/86.] Repealed by 92-01-069, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139.

51-16-070 Exceptions. [Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-070, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-070, filed 11/26/85, effective 6/11/86.] Repealed by 92-01-069, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139.

51-16-090 Submittal of proposed city or county amendments. [Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-090, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-090, filed 11/26/85, effective 6/11/86.] Repealed by 90-13-033, filed 6/13/90, effective 7/23/90. Statutory Authority: RCW 19.27.060 (7)(b).

51-16-100 Review of city and county amendments previously approved by the council. [Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-100, filed 12/1/88, effective 7/1/89.] Repealed by 92-01-069, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139.

WAC 51-16-010 Authority. These guidelines are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139. 92-01-069, § 51-16-010, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-010, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-010, filed 11/26/85, effective 6/11/86.]

WAC 51-16-020 Purpose. The purpose of these guidelines is to provide local governments with amendatory language for specific applications. The guidelines are not required to be adopted and enforced by local governments.

[Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139. 92-01-069, § 51-16-020, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-020, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-020, filed 11/26/85, effective 6/11/86.]

WAC 51-16-030 Exemptions for indigent housing guidelines. Cities and counties are permitted the option of adopting exemptions from the state building code requirements for buildings whose character of use or occupancy has been changed in order to provide housing for indigent persons. The adoption of an ordinance or resolution by cities and counties for the purpose to provide for occupancy exemptions for indigent housing as outlined in this section, shall not be considered a local government residential amendment requiring approval by the state building code council.

The guideline shall read as follows:

The character of use or occupancy of an existing building located in this state, may be changed in order to provide housing for indigent persons, without conforming to all of the requirements of the State Building Code provided that:

1. The building official has reviewed and approved the proposed exemption; and,

2. The proposed housing for indigent persons is less hazardous than the existing use; and,

3. Any code deficiencies exempted pose no threat to human life, health, or safety; and,

4. The building or buildings exempted are owned or administered by a public agency or nonprofit corporation; and,

5. The exemption is authorized for no more than five years, subject to renewal of the exemption by the building official.

[Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139. 92-01-069, § 51-16-030, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.020 and 19.27.074. 91-01-117, § 51-16-030, filed 12/19/90, effective 7/1/91. Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-16-030, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074. 88-24-018 and 89-11-081 (Orders 88-11 and 88-11A), § 51-16-030, filed 12/1/88 and 5/23/89, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-030, filed 11/26/85, effective 6/11/86.]

WAC 51-16-080 Permit exemptions guideline. Cities and counties are permitted the option of adopting a one thousand five hundred dollar building permit exemption for certain construction and alteration activities for Group R, Division 3 and Group M, Division 1 Occupancies. To adopt the permit exemption guideline, the following section of the 1991 Uniform Building Code shall be amended as follows:

(1) Section 301(b) of the Uniform Building Code shall be amended to read as follows:

(b) Exempted work. A building permit shall not be required for the following:

1. One-story detached accessory buildings used as tool and storage sheds, playhouses and similar uses, provided the projected roof area does not exceed one hundred twenty square feet.

2. Fences not over six feet high.

3. Oil derricks.

4. Movable cases, counters, and partitions not over five feet nine inches high.

5. Retaining walls which are not over four feet in height measured from the bottom of the footing to the top of

the wall, unless supporting a surcharge or impounding Class I, II, or III-A liquids.

6. Water tanks supported directly upon grade if the capacity does not exceed five thousand gallons and the ratio of height to diameter or width does not exceed two to one.

7. Platforms, walks, and driveways not more than thirty inches above grade and not over any basement or story below.

8. Painting, papering, and similar finish work.

9. Temporary motion picture, television, and theater stage sets and scenery.

10. Window awnings supported by an exterior wall of Group R, Division 3, and Group M Occupancies when projecting not more than fifty-four inches.

11. Prefabricated swimming pools accessory to a Group R, Division 3 Occupancy in which the pool walls are entirely above the adjacent grade and if the capacity does not exceed five thousand gallons.

12. Minor construction and alteration activities to Group R, Division 3 and Group M, Division 1 Occupancies, as determined by the building official, which the total valuation, as determined in Section 304(b) or as documented by the applicant to the satisfaction of the building official, does not exceed one thousand five hundred dollars in any twelve-month period: *Provided,* That the construction and/or alteration activity does not affect any structural components, or reduce existing egress, light, air, and ventilation conditions. This exemption does not include electrical, plumbing, or mechanical activities. The permit exemption shall not otherwise exempt the construction or alteration from the substantive standards of the codes enumerated in RCW 19.27.031, as amended and maintained by the state building code council under RCW 19.27.070.

Unless otherwise exempted, separate plumbing, electrical, and mechanical permits will be required for the above exempted items.

Exemption from the permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction.

The adoption of an ordinance or resolution by cities and counties for the purpose to provide for a permit exemption as outlined in this section, shall not be considered a local government residential amendment requiring approval by the state building code council.

[Statutory Authority: RCW 19.27.074, chapter 19.27 RCW and 1991 c 139. 92-01-069, § 51-16-080, filed 12/13/91, effective 7/1/92. Statutory Authority: RCW 19.27.060 (7)(b). 90-13-033, § 51-16-080, filed 6/13/90, effective 7/23/90. Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-080, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-080, filed 11/26/85, effective 6/11/86.]

Chapter 51-19 WAC
WASHINGTON STATE HISTORIC BUILDING CODE

WAC

PART IX APPENDICES

PART I
TITLE AND SCOPE

WAC 51-19-100 Title. This code shall be known as the Washington State Historic Building Code, hereinafter referred to as the HBC.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-100, filed 12/18/90, effective 7/1/91.]

WAC 51-19-110 Purpose. It is the purpose of the HBC to provide regulations, as prescribed in RCW 19.27.120(2), providing alternatives, when authorized by the appropriate building official, to conformance to all the requirements of the codes adopted under RCW 19.27.031, for repairs, alterations, and additions necessary for the preservation, restoration and related reconstruction, rehabilitation, strengthening, or relocation of buildings or structures designated as historic buildings, in accordance with RCW 19.27.120(1). Such regulations are intended to preserve original, or restored architectural elements and features, to encourage energy conservation, barrier-free access and a cost-effective approach to preservation, and to provide a historic building or structure that will be less hazardous, based on accepted life and fire safety practices, than the existing building. These regulations, when authorized by the appropriate building official, control and allow alternatives to any and all codes enumerated in RCW 19.27.031 when dealing with historic buildings or sites.

The purpose of this code is not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefited by the terms of this code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-110, filed 12/18/90, effective 7/1/91.]

WAC 51-19-120 Scope. The provisions of the HBC shall constitute the minimum standards for the preservation, restoration and related reconstruction, rehabilitation, strengthening, or relocation of buildings or structures, changes of occupancy and alteration or repair of historic buildings. Whenever reference is made to an appendix in this code, the provisions of the appendix shall not apply unless specifically adopted.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-120, filed 12/18/90, effective 7/1/91.]

WAC 51-19-130 Existing uses. Historic buildings may have their existing use or occupancy continued if such use or occupancy was legal at the time of the adoption of the HBC, provided such continued use is not dangerous to life and that subsequently adopted regulations specifically applicable to historic buildings or structures are satisfied.

Nothing in the HBC shall be construed to allow the degradation of those systems, devices and equipment required by the prevailing codes under which the building was constructed.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-130, filed 12/18/90, effective 7/1/91.]

WAC 51-19-140 Additions, alterations, and repairs. Buildings and structures to which additions, alterations, or repairs are made shall comply with all the requirements of the Building Code for new construction except as specifically provided in the HBC. Additions, alterations, or repairs may be made to any building or structure without requiring the historic building or structure to comply with all the requirements of the Building Code, provided:

(1) Additions shall conform to the requirements for a new building or structure.

(2) Additions, alterations, or repairs shall not cause a historic building or structure to become unsafe or overloaded.

(3) New additions shall not add to or cause a historic building to exceed the height, number of stories, or area specified for new buildings.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-140, filed 12/18/90, effective 7/1/91.]

WAC 51-19-150 Change of occupancy. Any change in the use or occupancy of a historic building or structure shall comply with the provisions of the HBC. Any building which involves a change in use or occupancy shall not exceed the height, number of stories, and area permitted for new buildings, except as permitted in the HBC and local ordinances.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-150, filed 12/18/90, effective 7/1/91.]

WAC 51-19-160 Maintenance. All buildings and structures and all parts thereof shall be maintained in a safe and sanitary condition. All systems, devices, or safeguards which were required by the prevailing codes under which the building was constructed shall be maintained in conformance with the requirements of the HBC. The owner or the owner's designated agent shall be responsible for the maintenance of buildings and structures. To determine compliance with this section, the building official may cause any structure to be reinspected.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-160, filed 12/18/90, effective 7/1/91.]

WAC 51-19-170 Alternative materials, designs, and methods. The provisions of this code are not intended to prevent the use of any material, design, or method of construction not specifically prescribed by the HBC, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of the HBC and that the material and method of work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety, and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding use of an alternate. The details

of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-170, filed 12/18/90, effective 7/1/91.]

WAC 51-19-180 Modifications. Whenever there are practical difficulties involved in carrying out the provisions of the HBC, the building official may accept compliance alternatives or grant modifications for individual cases, provided the building official shall first find that a significant reason makes the strict letter of the HBC impractical and that the compliance alternative or modification is in conformity with the intent and purpose of the HBC and that such compliance alternative or modification does not lessen health, life-safety, and the intent of any fire-safety requirements or any degree of structural integrity. The details of any action granting modifications or the acceptance of a compliance alternative shall be recorded and entered in the files of the code enforcement agency.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-180, filed 12/18/90, effective 7/1/91.]

WAC 51-19-190 Tests. Whenever there is insufficient evidence of compliance with any of the provisions of the HBC or evidence that any material or construction does not conform to the requirements of the HBC, the building official may require tests as proof of compliance to be made at no expense to the jurisdiction.

Test methods shall be as specified by the HBC, the Building Code, or by other recognized test standards. If there are no recognized and accepted test methods for the proposed alternate, the building official shall determine test procedures.

All tests shall be made by an approved agency. Reports of such tests shall be retained by the building official for the period required for the retention of public records.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-190, filed 12/18/90, effective 7/1/91.]

PART II
ADMINISTRATION

WAC 51-19-200 Enforcement. The building official is hereby authorized to enforce the provisions of the HBC. The building official shall have the power to render interpretations of the HBC and to adopt and enforce rules and regulations supplemental to this code as may be deemed necessary in order to clarify the application of the provisions of the HBC. Such interpretations, rules, and regulations shall be in conformity with the intent and purpose of the HBC.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-200, filed 12/18/90, effective 7/1/91.]

WAC 51-19-210 Permits. Buildings or structures regulated by the HBC shall not be enlarged, altered, repaired, improved, or converted unless a separate permit for each building or structure has been obtained from the building official in accordance with and in the manner prescribed in the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-210, filed 12/18/90, effective 7/1/91.]

WAC 51-19-220 Inspection. All buildings or structures within the scope of this code and all construction or work for which a permit is required shall be subject to inspection by the building official in accordance with and in the manner prescribed in the HBC and the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-220, filed 12/18/90, effective 7/1/91.]

WAC 51-19-230 Repairs. Repairs to any portion of a historic building or structure may be made with original materials and original methods of construction, subject to provisions of the HBC.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-230, filed 12/18/90, effective 7/1/91.]

WAC 51-19-240 Relocated buildings. Relocated historic buildings shall be considered a historic building for the purposes of the HBC. Relocated residential buildings in or within a county or city are not required to meet the full requirements of the Building Code, as prescribed in RCW 19.27.180, provided the occupancy classification of the building or structure is not changed as a result of the move. If an occupancy classification change occurs as a result of the move, the building or structure shall be reviewed under Part VI, Change of occupancy standards. Relocated historic buildings and structures shall be so sited that exterior wall and opening requirements comply with the Building Code or the compliance alternatives of the HBC. Foundations of relocated historic buildings and structures shall comply with the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-240, filed 12/18/90, effective 7/1/91.]

WAC 51-19-250 Right of entry. Whenever necessary to make an inspection to enforce any of the provisions of the HBC, or whenever the building official or an authorized representative has reasonable cause to believe that there exists in any building or upon any premises any condition or code violation which makes such building or premises unsafe, dangerous or hazardous, the building official or an authorized representative may enter such building or premises at all reasonable times to inspect the same or to perform any duty imposed upon the building official by the HBC, provided that if such building or premises be occupied, proper credentials shall first be presented and entry requested; and if such building or premises be unoccupied, the official shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry. If such entry is refused, the building official or an authorized representative shall have recourse to every remedy provided by law to secure entry.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-250, filed 12/18/90, effective 7/1/91.]

WAC 51-19-260 Liability. The building official or an authorized representative charged with the enforcement of the HBC, acting in good faith and without malice in the discharge of the prescribed duties, shall not thereby render themselves liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of those duties. Any suit brought against the building official or employee because of such act or omission performed in the enforcement of any provision of the HBC shall be defended by the jurisdiction until final termination of such proceedings and any judgment resulting therefrom shall be assumed by the jurisdiction.

The HBC shall not be construed to relieve from or lessen the responsibility of any person owning, operating, or controlling any building or structure for any damages to persons or property caused by defects, nor shall the code enforcement agency or its parent jurisdiction be held as assuming any such liability by reason of the inspections authorized by the HBC or any permits or certificates issued under the HBC.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-260, filed 12/18/90, effective 7/1/91.]

WAC 51-19-270 Unsafe buildings or structures. All buildings or structures regulated by the HBC which are structurally unsafe or not provided with adequate egress, or which constitute a fire hazard or are otherwise dangerous to human life are, for the purpose of this section, unsafe. Unsafe buildings shall comply with section 203 of the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-270, filed 12/18/90, effective 7/1/91.]

WAC 51-19-280 Appeals. The board of appeals established under the Building Code shall have authority to provide for final interpretation of the provision of the HBC and to hear appeals.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-280, filed 12/18/90, effective 7/1/91.]

PART III
DEFINITIONS

WAC 51-19-300 Definitions. For the purpose of the HBC, certain terms, phrases, words, and their derivatives shall be construed as specified in this chapter. Words used in the singular include the plural and the plural the singular. Words used in the masculine gender include the feminine and the feminine the masculine.

Where terms are not defined, they shall have their ordinary accepted meanings within the context in which they are used. In the event there is a question about the definition of a term, the definitions for terms in the codes enumerated in RCW 19.27.031 and the edition of **Webster's Dictionary,** referenced therein shall be considered as the sources for providing ordinarily accepted meanings.

"Adaptive use" is the process of adapting a building to accomplish a use other than that for which it was designed; i.e., a piano factory being converted into housing, or a mansion into an office or apartments.

"Addition" is an extension or increase in floor area or height of a building or structure.

"Alter or alteration" is any change, addition, or modification in construction or occupancy.

"Approved agency" is an established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.

"Building" is any structure used or intended for supporting or sheltering any use or occupancy. (See structure.)

"Building Code" is the Uniform Building Code, promulgated by the International Conference of Building Officials as adopted by the state building code council.

"Building official" is the officer or other designated authority charged with the administration and enforcement of the HBC, or a duly authorized representative.

"Building service equipment" refers to the plumbing, mechanical, electrical, and elevator equipment including piping, wiring, fixtures, and other accessories which provide sanitation, lighting, heating, ventilation, cooling, refrigeration, firefighting, and transportation facilities essential for the habitable occupancy of the building or structure for its designated use and occupancy.

"Certified local government" or "CLG" means the local government has been certified by the state historic preservation officer as having established its own historic preservation commission and a program meeting federal and state standards.

"Dangerous Building Code" is the code, adopted by this jurisdiction, which outlines the processes and procedures for the determination and abatement of dangerous buildings.

"Electrical Code" is the National Electrical Code, promulgated by the National Fire Protection Association, as adopted by the Washington state department of labor and industries, electrical section.

"Equivalency" is meeting the intent of the HBC by means other than those detailed in specific code provisions.

"Fire hazard" is any thing or act which increases or may cause an increase of the hazard or menace of fire to a greater degree than that customarily recognized as normal by persons in the public service regularly engaged in preventing, suppressing, or extinguishing fire; or which may obstruct, delay, hinder, or interfere with the operations of the fire department or the egress of occupants in the event of fire.

"Historic building" is any structure, collection of structures, and their associated sites, deemed of importance to the history, architecture, or culture of an area by an appropriate local, state, or federal governmental jurisdiction. Included shall be structures on official national, state, or local historic registers or official listings such as the National Register of Historic Places, the state register of historic places, state points of historical interest, and registers or listings of historical or architecturally significant sites, places, historic districts, or landmarks as adopted by a certified local government.

"Historic fabric" consists of the original materials and portions of the building intact when exposed or as they appeared and were used in the past.

"Historical aspects" are the particular features of the historic site, building, or structure that gives it its historic significance. Features may include but are not limited to one or more of the following: Historical background,

noteworthy architecture, unique design, works of art, memorabilia, and artifacts.

"Imminent hazard" is a condition which could cause serious or life threatening injury or death at any time.

"Occupancy" is the purpose for which a building, or part thereof, is used or intended to be used.

"Original materials" are those portions of the structure's fabric that existed during the period deemed to be most architecturally and/or historically significant.

"Preservation" is the maintenance of the structure in its present condition or as originally constructed. Preservation aims at halting further deterioration and providing structural safety, but does not contemplate significant rebuilding. Preservation includes techniques of arresting or slowing the deterioration of a structure; improvement of structural conditions to make a structure safe, habitable, or otherwise useful; normal maintenance and minor repairs that do not change or adversely affect the fabric or appearance of a structure.

"Prevailing code" is the "regular building regulations" which governed the design and construction or alteration of historical buildings within the jurisdiction of the enforcing agency at the time of their construction.

"Reconstruction" is the process of rebuilding a nonextant structure or portion of a structure to its original appearance through archival and archeological investigation. Although parts of the original structure are sometimes included in the reconstruction, the process usually involves new construction materials.

"Rehabilitation" involves equipping the building or facility for an extended useful life with a minimum alteration of original construction or the process of returning a structure to a state of usefulness by repairs, alterations, or additions.

"Relocation" involves any structure or a portion of a structure that may be moved to a new location.

"Renovation" is to make sound again any structure involved under the various definitions hereunder by cleanup, repair, and replacement of deteriorated detail or structure.

"Repair" is the reconstruction, renovation, or renewal of any portion of a historic building for the purpose of its maintenance.

"Reproduction" is a duplication, copy, or close imitation of the original.

"Restoration" is the process of accurately recovering, by the removal of later work and the replacement of missing earlier work, the form and details of a structure, together with its setting, as it appeared at a particular period of time.

"Structure" is that which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-300, filed 12/18/90, effective 7/1/91.]

PART IV
FIRE AND LIFE SAFETY STANDARDS

WAC 51-19-400 General. Safety to life in historic buildings and structures shall meet the intent of the Building Code. The provisions of this section shall be deemed as meeting the intent of the Historic Building Code, provided that none of the fire and life-safety features required by the prevailing codes under which the building was constructed will be reduced below the level established by either the HBC or the equivalent provisions of the currently adopted Building Code, whichever is least stringent. Alterations or repairs to a historic building or structure which are nonstructural and do not adversely affect any structural member or any part of the building or structure having required fire resistance may be made with the same materials of which the building or structure is constructed. Fire resistive ratings of archaic materials may be evaluated based upon the Guideline on Fire Ratings of Archaic Materials and Assemblies from Guideline 2 of the Uniform Code for Building Conservation.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-400, filed 12/18/90, effective 7/1/91.]

WAC 51-19-410 Exit systems. (1) Exit system capacity and the arrangement of exits shall comply with the requirements of the Building Code. Exit systems shall comply with the provisions of subsections (1) through (5) of this section, or the provisions of the prevailing code under which the building was constructed, whichever is more stringent. If any provision of the HBC or the prevailing code under which a building was constructed is more stringent than the currently adopted Building Code, the exit system shall comply with the provision of the currently adopted Building Code.

(2) All elements of the exit system shall be of sufficient size, width, and arrangement to provide safe and adequate means of egress. Every required exit shall have access to a public way, directly or through yards, courts or similar spaces, and such access shall be permanently maintained clear of any obstruction which would impede exiting.

(3) Occupants of every floor above the first story and in basements shall have access to at least two separate exits. A fire escape shall not be substituted for a stairway which was required by the prevailing codes under which the building was constructed.

EXCEPTIONS:
(a) In all occupancies, second stories with an occupant load of less than ten may have one exit.
(b) Only one exit need be provided from the second story within an individual dwelling unit which has an occupant load of less than ten.
(c) Two or more dwelling units on the second story may have access to only one common exit when the total occupant load does not exceed ten.
(d) Floors and basements used exclusively for service of the building may have one exit. For the purposes of this exception, storage rooms, laundry rooms, maintenance offices, and similar uses shall not be considered as providing service to the building.
(e) Basements within an individual dwelling unit having an occupant load of less than ten may have one exit.
(f) Occupied roofs of Group R, Division 3 occupancies may have one exit if such occupied areas are less than five hundred square feet and located no higher than immediately above the second story.

(4) Corridors serving as a part of the exit system which have an occupant load of thirty or more in a Group A, B, E, or H occupancy or an occupant load of ten or more in a Group R, Division 1 or Group I occupancy shall have walls

and ceilings of not less than one hour fire resistive construction. Existing walls and ceilings surfaced with wood lath and plaster or one-half inch thick gypsum wallboard may be permitted in lieu of one hour fire resistive construction, provided the surfaces are in good condition.

Door openings into such corridors shall be protected by a tight fitting smoke and draft control assembly having a fire protection rating of not less than twenty minutes when such opening protection was required by the prevailing codes under which the building was constructed. Door closing devices, door gaskets, and other requirements imposed by the prevailing codes under which the building was constructed shall be maintained. When the building was constructed under a code which did not require twenty minute smoke and draft control assemblies, doorway openings shall be protected by doors having a fire protection rating of not less than twenty minutes or by a minimum one and three-eighths inch thick, solid bonded, wood core door or an equivalent insulated steel door. In such case, the frames need not have a fire resistive time period. Doors shall be maintained self-closing or shall be automatic closing, self-latching by activation of a smoke detector.

Transoms and openings other than doors from corridors to rooms shall be protected as required by the Building Code. Existing transoms may be maintained if fixed in the closed position. When the code under which the building was constructed permitted unprotected transoms or other unprotected openings, other than doors, such transoms or openings shall be covered with a minimum of three-fourths-inch-thick plywood, one-half-inch-thick gypsum wallboard, fixed glazing listed and labeled for a fire protection rating of at least three-fourths hour or equivalent material on the room side. Openings with fixed wired glass set in steel frames are permitted in corridor walls and ceilings.

EXCEPTION: Existing corridor walls, ceilings, and opening protection not in compliance with the above may be continued when the building is protected with an approved automatic sprinkler system throughout: *Provided,* That a draft gasket assembly on sound, solid, self-closing, self-latching doors at door openings is installed and that sealing, caulking, and duct penetrations shall have dampers in all one-hour rated exit corridors. Such sprinkler system may be supplied from the domestic water supply system, provided the system is of adequate pressure, capacity, and sizing for the combined domestic and sprinkler requirements.

(5) Every dwelling unit, guest room, or sleeping rooms shall have access directly to the outside or to a public corridor or exit balcony.

(6) Existing fire escapes complying with this section may be accepted by the building official as one of the required exits. The fire escape shall not be the primary or the only exit. Fire escapes shall not take the place of stairways required by the codes under which the building was constructed.

Fire escapes shall comply with the following:

(a) Access from a corridor shall not be through an intervening room.

EXCEPTION: Access through an intervening room may be permitted if the intervening door is not lockable and an exit sign is installed above the door which will direct occupants to the fire escape.

(b) All openings in an exterior wall below or within ten feet, measured horizontally, of an existing fire escape serving a building over two stories in height shall be protected by fire assembly having a minimum three-fourths hour fire protection rating, and where operable be self-closing. When openings are located within a recess or vestibule, adjacent enclosure walls shall be of not less than one hour fire resistive construction.

(c) Egress from the building shall be by an opening having a minimum clear width and height of not less than twenty-nine inches. Such openings shall be openable from the inside without the use of a key or special knowledge or effort. The sill of an opening giving access to the fire escape shall be not more than thirty inches above the floor of the building or balcony.

(d) Fire escape stairways and their balconies shall support their dead load plus a live load of not less than one hundred pounds per square foot or concentrated load of three hundred pounds placed anywhere on the balcony or stairway so as to produce the maximum stress conditions. The stairway shall have a pitch not to exceed sixty degrees from the horizontal and shall have a minimum width of eighteen inches. The stairway shall be provided with a top and intermediate railing on each side. Treads shall be not less than four inches in width and the rise between treads shall not exceed ten inches. All stairway and balcony railings shall support a horizontally applied force of not less than fifty pounds per lineal foot of railing or a concentrated load of two hundred pounds placed anywhere on the railing so as to produce the maximum stress conditions.

(e) Fire escape balconies shall be not less than forty-four inches in width with no floor opening greater than five-eighths inch in width except the stairway opening. Stairway openings in such balconies shall be not less than twenty-two inches by forty-four inches. The guardrail of each balcony shall be not less than thirty-six inches high with not more than nine inches between intermediate rails.

(f) Fire escapes shall extend to the roof or provide an approved gooseneck ladder between the top floor landing and the roof when serving buildings four or more stories in height having roofs with a slope not exceeding four in twelve. Such ladders shall be designed and connected to the building to withstand a horizontal force of one hundred pounds per lineal foot; each rung shall support a concentrated load of five hundred pounds placed anywhere on the rung so as to produce the maximum stress conditions. All ladders shall be at least fifteen inches in clear width, be located within twelve inches of the building, and shall be placed flatwise relative to the face of the building. Ladder rungs shall be three-quarters inch in diameter and shall be located ten inches to twelve inches on center. Openings for roof access ladders through cornices and similar projections shall have minimum dimensions of thirty inches by thirty-three inches.

(g) The lowest balcony shall be not more than eighteen feet from the ground. Fire escapes shall extend to the ground or be provided with counterbalanced stairs reaching to the ground.

(h) Fire escapes shall be kept clear and unobstructed at all times and maintained in good working order.

(i) The fire escape shall have a clearance from electrical service conductors as required by the Electrical Code.

(7) Existing winding or spiral stairways may serve as one exit from a building, provided that a complying handrail

is located at the stair's outside perimeter. (See WAC 51-19-440.) A winding or spiral stairway may not be the principal exit when used in conjunction with a fire escape as a second exit. The width of a spiral or winding stair may be used in the calculation of provided exit width when in compliance with this section. Circular stairways complying with the Building Code shall be acceptable as an exit.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-410, filed 12/18/90, effective 7/1/91.]

WAC 51-19-420 Structural safety. A building or structure or its individual structural members that exceed the limits established by the Dangerous Buildings Code shall be replaced or strengthened in order that the building, structure, or individual structural members will comply with the requirements of the Building Code for new construction. Roofs, floors, walls, foundations, and all structural components of buildings or structures shall be capable of resisting the forces and loads for the occupancies intended, as specified in the prevailing codes under which the building was constructed or in chapter 23 of the Building Code, except for earthquake forces and loads. See Part V of this chapter for earthquake hazard reduction requirements.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-420, filed 12/18/90, effective 7/1/91.]

WAC 51-19-430 Weather protection. (1) Every building shall provide weather protected shelter for the occupants against the elements and exclude dampness.

(2) The roof of every building or structure shall provide weather protection for the building. All devices which were provided or are required to prevent ponding or flooding or to convey the roof water shall be capable of fulfilling that purpose.

(3) All weather exposed surfaces of historic buildings or structures shall provide weather protection.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-430, filed 12/18/90, effective 7/1/91.]

WAC 51-19-440 Other safety features. (1)(a) The largest tread run within any flight of stairs shall not exceed the smallest by more than three-eighths inch. The greatest riser height within any flight of stairs shall not exceed the smallest by more than three-eighths inch.

EXCEPTION: Existing spiral and circular stairs shall be exempt from the variance in tread size requirement.

(b) Every stairway shall have at least one handrail.

EXCEPTION: A handrail is not required for existing stairs having less than four risers.

Spiral and winding stairways shall have a handrail on the outside perimeter.

(2) All unenclosed floor and roof openings, open and glazed sides of stairways, landings and ramps, balconies or porches which are more than thirty inches above grade or floor below, and roofs used for other than service of the building shall be protected by a guardrail.

EXCEPTION: Guardrails need not be provided at the following locations:
(a) On the loading side of loading docks.
(b) On the auditorium side of a stage or enclosed platform.
(c) On private stairways thirty inches or less in height.

Existing guardrails, other than guardrails located on the open side of a stairway, which are at least thirty-six inches in height shall be permitted to remain. Guardrails lower than thirty-six inches in height shall be augmented or corrected to raise their effective height to thirty-six inches. Guardrails for stairways, exclusive of their landings, may have a height which is not less than thirty inches measured above the nosing of treads.

The spacing between existing intermediate railings or openings in existing ornamental patterns in significant historical staircases may be accepted; otherwise the Building Code shall apply. Missing elements or members of a guardrail may be replaced in a manner which will preserve the historic appearance of the building or structure.

(3) The installation or replacement of glass shall be as required for new construction by the Building Code and the requirements for energy conservation in Part VIII of this code.

(4) All wires and equipment, and installations thereof, that convey electric current, in, on, or about buildings or structures shall be in strict conformity with chapter 19.28 RCW, the statutes of the state of Washington, and the rules issued by the Washington state department of labor and industries.

(5) Leaking drain or supply lines shall be repaired or replaced. All unsafe conditions shall be corrected. Any cross connections or siphonage between fixtures shall be corrected.

(6) Mechanical systems shall have any unsafe conditions corrected.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-440, filed 12/18/90, effective 7/1/91.]

WAC 51-19-450 Light, ventilation, sanitation, smoke detectors, and heating. (1) For Group R occupancies, light, ventilation, sanitation, smoke detectors, and heating shall meet the requirements of the Building Code.

(2) Skylights set at an angle of less than forty-five degrees from the horizontal plane shall be mounted at least four inches above the plane of the roof on a curb constructed of materials as required for the frame. Skylights may be installed in the plane of the roof when the roof slope is greater than forty-five degrees from horizontal.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-450, filed 12/18/90, effective 7/1/91.]

WAC 51-19-460 Plumbing. All plumbing fixtures shall be connected to a sanitary sewer or to an approved private sewage disposal system. All plumbing fixtures shall be connected to an approved system of water supply and provided with hot and cold running water necessary for its normal operation. All plumbing fixtures shall be of an approved glazed earthenware type or of a similarly nonabsorbent material.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-460, filed 12/18/90, effective 7/1/91.]

PART V
EARTHQUAKE HAZARD REDUCTION

WAC 51-19-500 Survey or evaluation. When required by the building official a survey or evaluation shall be made by an architect or structural engineer licensed by the state to practice as such, who is knowledgeable in the earthquake resistant design of structures, regarding the structure's ability to resist the seismic loads prescribed by the Building Code requirements or by established alternate evaluation methodologies. Broad judgment may be exercised concerning the strength and performance of materials not recognized by the Building Code. Past historic records of the structure or similar structures may be used in the evaluation, including the effects of subsequent alterations. The capability of the structure to carry vertical and horizontal loads shall be evaluated. A complete, continuous and adequate stress path, including connections, from every part or portion of the structure to the ground shall be provided for the required vertical and horizontal forces.

Parapets and exterior decoration shall be investigated for conformance with the Building Code or evaluation methodologies and anchorage with the ability to resist seismic forces shall be required, except in the case where those parapets or decoration are judged to present no hazard to life safety.

A report shall be made of the findings of the survey and evaluation noting all deterioration of the existing structure and making recommendations for the repair of deterioration and for any reconstruction or strengthening which should be undertaken. Plans and specifications for the work done pursuant to the survey and evaluation prepared under this section shall be prepared under the responsible charge of an architect or structural engineer.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-500, filed 12/18/90, effective 7/1/91.]

WAC 51-19-510 Alternatives. Alternative materials and methods of construction may be substituted for those otherwise required by the HBC or by the recommendations of the earthquake survey and evaluation provided the alternative methods are necessary to preserve historic materials or features and that such alternative methods provide satisfactorily for the purposes intended, or are reasonably equivalent to the prescribed methods in quality, strength, effectiveness, fire resistance, durability, and safety.

The building official may request that sufficient evidence be submitted to substantiate any claims made regarding such alternative materials, evaluation methodologies, and alternative methods of construction.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-510, filed 12/18/90, effective 7/1/91.]

PART VI
CHANGE OF OCCUPANCY STANDARDS

WAC 51-19-600 General. The character of the occupancy of historic buildings and structures may be changed, provided the requirements of this chapter are met. Where no specific requirements are included herein, the building or structure shall comply with the Building Code.

Every change of occupancy to a classification in a different group or different division of the same group shall require a new certificate of occupancy regardless of whether any alterations are required by the HBC.

If the building or portion thereof does not conform to the requirements of the HBC for the proposed occupancy group or division, the building or portion thereof shall be made to conform to the Building Code except as specified in the HBC. The building official may issue a new certificate of occupancy stating that the building complies with the HBC.

The relative degree of hazard between different occupancy groups or between divisions of the same group shall be as set forth in the hazard category classifications, Tables Nos. VI-1 through VI-5. A historic building may have its occupancy changed to an occupancy within the same hazard group or to an occupancy in a lesser hazard group without complying with all of the provisions of this chapter. A historic building shall comply with the requirements of the Building Code, except as specified in this chapter, when a change in occupancy will place it in a higher hazard group or when the occupancy is changed to Group A, Division 1 or 2, Group E, H, or I.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-600, filed 12/18/90, effective 7/1/91.]

WAC 51-19-610 Heights and area. Heights and areas of buildings and structures shall meet the requirements of the Building Code for the new occupancy.

Exception: Historic buildings exceeding the maximum allowable heights and areas permitted for new buildings may undergo a change of occupancy if the hazard level of the new occupancy is equal to or less than the existing hazard group as shown in Table No. VI-1.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-610, filed 12/18/90, effective 7/1/91.]

WAC 51-19-620 Fire safety. (1) When a change of occupancy is made to a higher hazard group as shown in Table No. VI-1, all elements of the exit system shall comply with the requirements of the Building Code.

EXCEPTIONS: (a) Existing exit corridors and stairways meeting the requirements of Part IV of this chapter may be used.
(b) Exit system elements may meet alternative compliance requirements as approved by the building official.

(2) Existing exit systems complying with Part IV shall be accepted if the occupancy change is to an equal or lesser hazard group when evaluated in accordance with Table No. VI-2.

(3) When a change of occupancy is made to a higher hazard group as shown in Table No. VI-3, occupancy separations shall be provided as specified in the Building Code. When approved by the building official, existing wood lath and plaster in good condition or one-half inch gypsum wall board may be accepted where a one hour occupancy separation is required.

(4)(a) Vertical shafts may be designed to meet the requirements of atriums as required by the Building Code or the requirements of this chapter.

(b) Interior stairways shall be enclosed as required by the Building Code when a change of occupancy is made to a higher hazard group as shown in Table No. VI-4.

EXCEPTIONS: (i) In other than Group I occupancies, an enclosure will not be required for openings serving only one adjacent floor and not connected with corridors or stairways serving other floors.

(ii) Existing stairways not enclosed need not be enclosed in a continuous vertical shaft if each story is separated from other stories by one hour fire resistive construction or approved wired glass set in steel frames and all exit corridors are sprinklered. The openings between the corridor and occupant space shall have at least one quick response sprinkler head above the openings on the tenant side, with a draft gasket assembly on sound, solid, self-closing doors. The sprinkler system may be supplied from the domestic water supply system, provided the system is of adequate pressure, capacity, and sizing for the combined domestic and sprinkler requirements.

(c) Interior shafts, including, but not limited to, elevator hoistways, service and utility shafts, shall be enclosed with a minimum of one-hour fire-resistive construction.

EXCEPTIONS: (i) Vertical openings, other than stairways, need not be enclosed if the entire building is provided with an approved automatic sprinkler system. The sprinkler system may be supplied from the domestic water supply system, provided the system is of adequate pressure, capacity, and sizing for the combined domestic and sprinkler requirements.

(ii) Where one-hour fire-resistive floor construction is required, vertical shafts need not be enclosed when such shafts are blocked at every floor level by the installation of not less than two full inches of solid wood or equivalent construction.

(d) All openings into such shafts shall be protected by fire assemblies having a fire protection rating of not less than one hour and shall be maintained self-closing or shall be automatic closing by actuation of a smoke detector. All other openings shall be fire protected in an approved manner. Existing fusible link-type automatic door-closing devices may be permitted if the fusible link rating does not exceed one hundred thirty-five degrees.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-620, filed 12/18/90, effective 7/1/91.]

WAC 51-19-630 Property protection. (1) Exterior walls shall have fire resistance and opening protection as set forth in the Building Code. This provision shall not apply to walls at right angles to the property line.

EXCEPTIONS:

(a) Where a fire-resistive rating greater than two hours is required for a building of any type of construction, existing noncombustible exterior walls having a fire resistive rating equivalent to two hours as determined by the building official may be accepted, provided:

(i) The building is classified as a Group A, Division 3; Group B, Division 1 or Group B, Division 2 occupancy; and

(ii) The building does not exceed three stories in height; or

(iii) The building shall be of heavy timber construction, and does not exceed five stories in height. (The state Building Code council recommends the use of Guideline 2 of the Uniform Code for Building Conservation as reference in determining fire resistive rating equivalency.)

(b) Existing exterior walls shall be accepted if the occupancy is changed to a hazard group which is equal to or less than the existing occupancy as defined in Table No. VI-4.

(2) New openings in exterior walls shall be protected as required by the Building Code. Existing, nonconforming openings shall be protected by fire assembly having a minimum three-fourth hour fire protection rating, and where operable be self-closing. When openings in the exterior walls are required to be protected due to distance from the property line, the sum of the area of such openings shall not exceed fifty percent of the total wall area in each story.

EXCEPTIONS:

(a) Protected openings shall not be required for Group R, Division 1 occupancies which do not exceed three stories in height and which are located not less than three feet from the property line.

(b) Where opening protection is required, an automatic fire extinguishing system throughout may be substituted for opening protection.

(c) Opening protection may be omitted when the change of occupancy is to an equal or lower hazard classification in accordance with Table No. VI-2.

(d) The building shall be of heavy timber construction, and does not exceed five stories in height.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-630, filed 12/18/90, effective 7/1/91.]

WAC 51-19-640 Structural safety. Buildings and structures shall meet the minimum level of performance for structural safety as specified in Parts IV and V of this chapter.

Historic buildings may undergo a change of occupancy if the hazard group is equal to or less than the existing occupancy as shown in Table No. VI-5. Buildings undergoing a change of occupancy to a more hazardous group shall meet the earthquake hazard reduction requirements of Part V of this chapter for the new occupancy.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-640, filed 12/18/90, effective 7/1/91.]

WAC 51-19-650 Light and ventilation. When deemed necessary by the building official, light and ventilation shall comply with the requirements of the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-650, filed 12/18/90, effective 7/1/91.]

WAC 51-19-660 Flame spread reduction. Where finish materials are required to have a flame-spread classification of Class III or better, existing nonconforming materials shall be surfaced with an approved fire retardant paint or finish.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-660, filed 12/18/90, effective 7/1/91.]

WAC 51-19-670 Roof coverings. Regardless of occupancy group, roof covering materials not less than Class C shall be permitted where a fire retardant roof covering is required. Nonrated materials may be acceptable only where approved by the building official.

TABLE NO. VI-1

HEIGHTS AND AREAS
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazard	Occupancy Classification*
1	A-1, H, I-3 (highest hazard group)
2	A-2, A-2.1, I-1, I-2

3	A-3, A-4, B, E, R-1
4	R-3, M (lowest hazard group)

* See Table 5-A of the Building Code.

TABLE NO. VI-2

LIFE SAFETY AND EXITS
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazard	Occupancy Classification*
1	A-1, A-2, A-2.1, E, I, H-1, H-2, H-3 and H-7 (highest hazard group)
2	A-3
3	R-1, R-3, B-2 dining and drinking establishments
4	B-2 all others, B-4, H other than H-1, H-2, H-3 and H-7
5	B-1, B-3
6	M (lowest hazard group)

* See Table 5-A of the Building Code.

TABLE NO. VI-3

OCCUPANCY SEPARATIONS
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazard	Occupancy Classification*
1	B-1, H, I (highest hazard group)
2	A, B-2, B-3, B-4
3	E
4	R-1, M
5	R-3 (lowest hazard group)

* See Table 5-A of the Building Code.

TABLE NO. VI-4

EXPOSURE OF EXTERIOR WALLS
AND STAIRWAY ENCLOSURES
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazard	Occupancy Classification*
1	H (highest hazard group)
2	B-2 mercantile and warehouses
3	A, E, I
4	B-1, B-2 all others, R
5	B-4, M (lowest hazard group)

* See Table 5-A of the Building Code.

TABLE NO. VI-5

EARTHQUAKE SAFETY
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazard	Occupancy Classification*
1	A, E, I (highest hazard group)
2	R-1
3	B-3, B-4, H
4	B-1, B-2
5	R-3, M (lowest hazard group)

* See Table 5-A of the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-670, filed 12/18/90, effective 7/1/91.]

PART VII
ACCESSIBILITY TO PERSONS WITH DISABILITIES

WAC 51-19-700 General. The HBC shall provide the standards for accessibility of historic buildings to persons with disabilities. The value of access to buildings, structures, and sites of historic and cultural significance can be best obtained by providing the greatest degree of access while preserving the historic or architectural features of a building. Where accessibility is required by chapter 51-10 WAC, such standards shall be incorporated as practical.

Code users may consult the appendix bibliography concerning accessibility designs in historic buildings. Appendix Table A- 901 is also provided to assist in application of the code.

Where additions are undertaken they shall incorporate useful accessible design features.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-700, filed 12/18/90, effective 7/1/91.]

WAC 51-19-710 Building access and use. (1) Entry. At least one primary entrance to a historic building shall be usable by persons with disabilities. When the building official, building designer, and local or state preservation officer concur that adaptation of a primary entrance will have a detrimental impact on the aesthetic or historic context of the entrance, then the building official may accept a reasonable alternate public entrance. When access is provided by other than a primary entrance, the entrance access shall be clearly indicated by directional signs. Accessible parking shall be located so as to provide the closest practical distance to the accessible entrance.

(2) Ramps.

(a) General. The building official shall accept alternate ramp designs which comply with the HBC when it is determined that installation of a ramp having a slope which complies with chapter 51-10 WAC cannot be achieved.

(b) Slope. The slope of the ramp shall be not steeper than one vertical to nine horizontal for a horizontal length not to exceed twelve feet. Ramps which have a horizontal length which does not exceed two feet may have a slope not to exceed one vertical to six horizontal. Adequate warnings shall be posted indicating steepness where slopes exceed the

requirements provided in the regulations for barrier-free facilities.

(3) Doors. Existing doorways which provide a net clear opening of not less than twenty-nine and one-half inches shall be deemed to meet the access requirements of this chapter.

(4) Changes in elevation. Changes in elevation of portions of buildings on accessible routes of travel shall be accessible by ramps or lifts consistent with the intent of the HBC.

(5) Toilet rooms. Where toilet facilities are provided, at least one such facility designed for use by persons with disabilities, shall be provided for each sex, or a separate facility usable by either sex located along an accessible route of travel. Alternate provisions providing substantially equivalent facilities shall comply with this code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-710, filed 12/18/90, effective 7/1/91.]

PART VIII
ENERGY CONSERVATION

WAC 51-19-800 General. Historic buildings shall comply with the energy conservation and ventilation and indoor air quality requirements of the Washington State Energy Code chapter 51-11 WAC and the Washington State Ventilation and Indoor Air Quality Code chapter 51-13 WAC. The building official may modify the specific requirements of the Energy Code for Historic Buildings and require in lieu thereof alternate requirements which will result in a reasonable degree of energy efficiency.

EXCEPTIONS: The historic elements of the following buildings and structures are exempt from the State Energy Code:
- Totally preserved buildings used as historical exhibits.
- Seasonal use buildings.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-800, filed 12/18/90, effective 7/1/91.]

WAC 51-19-810 Alternative energy conservation provisions. (1) General. The alternative energy conservation requirements as specified in this part may be applied to a historic building if approved by the building official. The building official may approve other alternatives designed to improve energy efficiency without loss of the historic fabric of the building.

(2) Building envelope requirements. Historic buildings shall meet the minimum thermal performance values specified in the energy code, or the alternative measures specified in this subsection.

(a) Attics. Where accessible, insulation shall be installed in the attic to the requirements of the Energy Code, or lesser levels to maintain adequate ventilation, to reduce condensation problems or to provide safety clearances around electrical wiring or utility systems.

Additional insulation with an integral vapor barrier shall not be installed on top of existing insulation. A vapor barrier shall not be installed between layers of insulation.

(b) Exterior walls. Accessible wall cavities where finishes are being disturbed by alteration or renovation work shall be insulated to the extent practical. If accessible, a vapor retarder shall be installed on the winter warm side of the insulation (facing the conditioned space). An approved vapor retarding paint or clear finish is an acceptable vapor retarder. Permeable materials on the exterior side of the cavity (or unheated side) or an air space or means of venting framing cavities to the exterior are required if insulation is added to the cavities in wood frame construction.

(c) Doors. Doors which are not of the original material or which are not replicas designed to be compatible with the historic aspects of the structure shall conform to the requirements of the Energy Code.

(d) Floors over crawl spaces. If accessible, adequately ventilated, and with ground clearance in conformance with Building Code requirements, insulation with an R-value of eleven or greater shall be installed in floors of unheated crawl spaces.

(e) Moisture control in crawl spaces. Minimum foundation ventilation shall be provided in unheated crawl spaces. The net-free area of ventilation shall be at least 1/300th of the floor area. The vents shall be distributed around the perimeter of the foundation as equally as practical to provide adequate cross-ventilation. If accessible, a black polyethylene vapor barrier shall be applied to cover the exposed earth as prescribed in the Building Code.

(f) Air leakage. Windows and doors.

(i) All exterior windows and doors shall be gasketed or weatherstripped.

(ii) If the existing windows and doors are replaced with factory manufactured windows, the windows shall be double glazed units or shall be equipped with interior or exterior storm windows.

(iii) Single glazed windows which are part of the historic features of the building may be retained, repaired, or restored with or without the addition of storm windows.

(g) Chimney flues. Chimney flues which are no longer in use shall be closed off and sealed against air leakage.

(h) Exterior openings. The following openings in the exterior building envelope shall be caulked, gasketed, or otherwise sealed:

(i) Exterior joints around window and door frames;

(ii) Penetrations of utility services through walls, floors, and roofs.

(iii) Any other penetrations as required by the building official.

(i) Insulation materials. New insulation materials shall conform to the applicable provisions of the building, mechanical, plumbing, and energy codes for fire-resistance, flame-spread, smoke-density ratings and Building Code provisions for roof and exposed deck ceiling insulation.

(3) Building mechanical systems. Existing heating, ventilation, and cooling systems which are part of the significant historic features of the building or structure, and which in the opinion of the building official do not constitute a safety hazard, may remain in use, be repaired or be replaced in kind. Replacement, alteration, or addition of other heating, ventilation, and cooling equipment shall comply with the provisions of the energy, ventilation and indoor air quality, mechanical, and plumbing codes.

(4) Water heating. Replacement or addition of water heating equipment shall comply with the provisions of the Energy Code.

(5) Lighting. Existing lighting may be retained, repaired, and replaced in kind or with replica fixtures. Areas of buildings or structures in which lighting is being replaced shall conform to the requirements of the Energy Code where practical. Appropriate clearances of insulation material from sources of heat; i.e., light fixtures, shall be as required by the Building Code requirements.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-810, filed 12/18/90, effective 7/1/91.]

PART IX
APPENDICES

WAC 51-19-900 Appendix A.

Table A - 901

	BUILDING FEATURES			
	ENTRY	DOORS	TOILET ROOMS	FLOORS & LEVELS
Instructions: 1. Determine Building Category; i.e., II.D. under Building Type and Historical Aspects. 2. Go to box in category under Building Features. 3. Numbers in box refer to the Alternatives List.	Prevailing Codes: Primary public entrance with access to elevators available	Prevailing Codes: -31 1/2" clear openings -5' level perpendicular to closed door -18" clear at strike side	Prevailing Codes: 5'-0"x 4'-8" stall clear Length 32" min. clear entry in front of compartment Door 32" clear Turn 60" diameter circle Lavy. 29" clear under for newly designed space. See WAC 51-10 Sec. 511.1.	Prevailing Codes: -Access to all floors, except in offices, retail shops -Floor on given story level or ramped.
Category (Building Type and Historical Aspects)	ENTRY See Alternatives List	DOORS See Alternatives List	TOILET ROOMS See Alternatives List	FLOORS & LEVELS See Alternatives List
I. Publicly owned or leased building providing governmental services to general public; i.e., City Hall, Courthouse, etc., adaptive use, restoration, or reconstruction.				
A. Exterior (shell) historical all or part, Interior nonhistorical.	2, 4	1, Exterior only None interior	None	N.A.
B. Interior historical-all or part, Exterior nonhistorical.		1,2 Interior only None exterior	1, 2	1, 2
C. All historical major change in use, change in occupancy.	2, 4	1, Exterior 1, 2 Interior only	1, 2	1, 2
D. All historical-minor change in use to equal or less intensive occupancy. Limited services.	2, 4	1, Exterior 1, 2, Interior only	1, 2	1, 2
II. Privately owned buildings offering services to consumers; i.e., taverns, restaurants, general shops, etc., or buildings owned by government and leased or consigned to private operator.				
A. Adaptive use restoration, reconstructions, Interior nonhistoric, Exterior historical (all or part).	1, 2, 3, 4	1, Exterior, and 1 Interior.	None	N.A.
B. Interior historical-(all or part), Exterior		None exterior,	1, 2, 3	N.A.
C. All historical-major change in use, change in occupancy, or mixed occupancy. Minor change of use to equal or less intensive occupancy.	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
D. Reconstruction, or restoration. No change in use except to museum. (Minor mixed occupancy with administration space would be allowed.)	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
E. Museum quality restoration and/or reconstruction including museum use. (Minor mixed occupancy compatible with that use would be allowed.) Also includes renovation of historical building or site.	1, 2, 3, 4	1, 2, 3	1, 2, 3,	1, 2, 3
III. Privately or publicly owned buildings used as museums or as site for display of the building itself; i.e., museum, schoolhouse, garden centers, galleries, etc.				
A. Reconstruction, or restoration. No change in use except to museum. (Minor mixed occupancy such as administrative would be allowed).	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
B. Museum quality restoration and/or reconstruction museum use (Minor mixed occupancy compatible with that would be allowed). Also includes renovation of historical building or site.	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
IV. Privately owned buildings not open to general public but employing 3 or more persons; i.e., business offices.				
A. Adaptive use-Interior nonhistorical, Exterior historical (all or part).	1, 2, 3, 4	1, 2, 3, Exterior, None interior	1, 2	1, 2, 3, Exterior Access, None interior access
B. Adaptive use-Interior historical, Exterior nonhistorical.	1, 2, 3, 4	None exterior, 1, 2, 3, interior	1, 2	None Exterior access, 1, 2, 3, interior access
C. All historical-major change in use, change in occupancy or mixed occupancy. Minor change of use to equal or less intensive occupancy.	1, 2, 3, 4	1 through 3	1, 2	1, 2, 3
D. Reconstruction, or restoration. No change in use-except to museum. (Minor mixed occupancy such as administrative would be allowed.)	1, 2, 3, 4	1 through 3	1, 2	1, 2, 3
V. Buildings employing less than 3 people.	All alternatives 1, 2, 3, 4	All alternatives 1-3	All alternatives 1-3	All alternatives 1-3

ALTERNATIVES LIST

These alternatives are listed in order of priority and are to be used with Table A-901.

ENTRY:
1. Ramp at greater than standard slope, but no greater than 1:9 for a horizontal distance not to exceed 12 feet at main, side, or rear entrance.
2. Access, listed in the order of priority, at grade or by ramp or lift to any entrance used by general public.
3. Ramp no greater than 1:6 slope for a distance not to exceed a horizontal distance of 2 feet at main, side, or rear entrance.
4. Access, listed in the order of priority, at grade, or by ramp, or lift at any entrance not used by general public but open (unlocked), with directional signs.

DOORS: (One means of entry into spaces requiring access)
1. 30-inch width of clear opening operable by single motion.
2. Usable 29 1/2 inches 66-175

clear opening with door(s) operable by single motion.
3. Single or double door to provide a usable 29 1/2 inches clear opening.

TOILET ROOMS:
1. Toilet facility of dimensions no less than those provided in the prevailing provisions in chapter 51-10 WAC designated as a unisex toilet for disabled persons.
2. Provide unisex toilet for disabled persons and general public.
3. No toilet for anyone.

FLOORS AND LEVELS:
1. Access to experiences, services, functions and materials and resources; i.e., maps, plans, courtroom, council chambers, etc., at accessible levels.
2. Access provided to levels and floors by ramps of greater than standard slope and no greater than 1:9 for horizontal distances not to exceed 12 feet. Lifts may be provided.
3. Access provided to levels and floors by ramps of 1:6 slope for horizontal distance not to exceed 2 feet. Adequate warnings shall be provided to indicate steepness of the slope.

USE NOTES:
1. Listed alternatives only apply to building requiring construction permits.
2. These alternatives should be used only where it is not possible to meet prevailing code.
3. Alternatives should be used only in those portions of the building that are historical.
4. Alternatives apply to access for physically disabled persons.
5. Alternatives apply to historic buildings only.
6. For other accessibility standards, see chapter 51-10 WAC.
7. Alternatives are listed in priority order.
8. No alternatives are allowed for simulations.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-900, filed 12/18/90, effective 7/1/91.]

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[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-901, filed 12/18/90, effective 7/1/91.]

Chapter 51-26 WAC

STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1991 EDITION OF THE UNIFORM PLUMBING CODE

WAC

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

51-26-1805 Implementation. [Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-1805, filed 12/13/91, effective 7/1/92.] Repealed by 93-01-164, filed 12/23/92, effective 7/1/93. Statutory Authority: RCW 19.27.170.

WAC 51-26-001 Authority. These rules are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-001, filed 12/13/91, effective 7/1/92.]

WAC 51-26-002 Purpose. The purpose of these rules is to implement the provisions of chapter 19.27 RCW, which provides that the state building code council shall maintain the State Building Code in a status which is consistent with the purpose as set forth in RCW 19.27.020. In maintaining the codes, the council shall regularly review updated versions of the codes adopted under the act, and other pertinent information, and shall amend the codes as deemed appropriate by the council.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-002, filed 12/13/91, effective 7/1/92.]

WAC 51-26-003 Uniform Plumbing Code. The 1991 edition of the Uniform Plumbing Code, published by the International Association of Plumbing and Mechanical Officials, is hereby adopted by reference with the following additions, deletions, and exceptions: *Provided,* That chapters 11 and 12 of this code are not adopted: *Provided further,* That those requirements of the Uniform Plumbing Code relating to venting of appliances as found in chapter 13 are not adopted.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-003, filed 12/13/91, effective 7/1/92.]

WAC 51-26-004 Exceptions. The exceptions and amendments to the uniform codes contained in the provisions of chapter 19.27 RCW shall apply in cases of conflict with any of the provisions of these rules.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-004, filed 12/13/91, effective 7/1/92.]

WAC 51-26-008 Implementation. The Uniform Plumbing Code adopted by chapter 51-26 WAC shall become effective in all counties and cities of this state on July 1, 1992, unless local amendments have been approved by the state building code council.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-008, filed 12/13/91, effective 7/1/92.]

WAC 51-26-0300 Chapter 3—General instructions and regulations.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-0300, filed 12/13/91, effective 7/1/92.]

WAC 51-26-0310 Prohibited fittings and practices. Section 310.

(a) No double hub fitting, single or double tee branch, single or double tapped tee branch, side inlet quarter bend, running thread, band, or saddle shall be used as a drainage fitting, except that a double hub sanitary tapped tee may be used on a vertical line as a fixture connection.

(b) No drainage or vent piping shall be drilled and tapped for the purpose of making connections thereto, and no cast iron soil pipe shall be threaded.

(c) No waste connection shall be made to a closet bend or stub of a water closet or similar fixture.

(d) Except as hereinafter provided in sections 613, 614, and 615, no vent pipe shall be used as a soil or waste pipe, nor shall any soil or waste pipe be used as a vent.

(e) No fitting, fixture and piping connection, appliance, device or method of installation which obstructs or retards the flow of water, wastes, sewage or air in the drainage or venting systems in an amount greater than the normal frictional resistance to flow, shall be used unless it is indicated as acceptable in this code or is approved by the administrative authority as having a desirable and acceptable function and of ultimate benefit to the proper and continuing functioning of the plumbing system. The enlargement of a three inch (76.2 mm) closet bend or stub to four inches (101.6 mm) shall not be considered an obstruction.

(f) Except for necessary valves, where intermembering or mixing of dissimilar metals occur, the point of connection shall be confined to exposed or accessible locations.

(g) All valves, pipes, and fittings shall be installed in correct relationship to the direction of flow.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-0310, filed 12/13/91, effective 7/1/92.]

WAC 51-26-0315 Protection of piping, materials, and structures. Section 315.

(a) All piping passing under or through walls shall be protected from breakage. All piping passing through or under cinders or other corrosive materials shall be protected from external corrosion in an approved manner. Approved provisions shall be made for expansion of hot water piping. Voids around piping passing through concrete floors on the ground shall be appropriately sealed.

(b) All piping in connection with a plumbing system shall be so installed that piping or connections will not be

subject to undue strains or stresses, and provisions shall be made for expansion, contraction, and structural settlement. No piping shall be directly embedded in concrete or masonry walls or footings. No structural member shall be seriously weakened or impaired by cutting, notching, or otherwise.

(c) All trenches deeper than the footing of any building or structure and paralleling the same must be at least forty-five degrees therefrom, unless permission be otherwise granted by the administrative authority.

(d) No building sewer or other drainage piping or part thereof, constructed of materials other than those approved for use under or within a building, shall be installed under or within two feet (.6 m) of any building or structure, or less than one foot (.3 m) below the surface of the ground.

(e) Piping subject to undue corrosion, erosion, or mechanical damage shall be protected in an approved manner.

(f) No water, soil, or waste pipe shall be installed or permitted outside of a building or in an exterior wall unless, where necessary, adequate provision is made to protect such pipe from freezing. All hot and cold water pipes installed outside the conditioned space shall be insulated to a minimum R-3.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-0315, filed 12/13/91, effective 7/1/92.]

WAC 51-26-0400 Chapter 4—Drainage systems.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-0400, filed 12/13/91, effective 7/1/92.]

WAC 51-26-0401 Materials. Section 401.

(a) Drainage piping shall be cast iron, galvanized steel, galvanized wrought iron, lead, copper, brass, Schedule 40 ABS DWV, Schedule 40 PVC DWV, extra strength vitrified clay pipe, or other approved materials having a smooth and uniform bore, except that:

(1) No galvanized wrought iron or galvanized steel pipe shall be used underground and shall be kept at least six inches (152.4 mm) above ground.

(2) No vitrified clay pipe or fittings shall be used above ground or where pressurized by a pump or ejector. They shall be kept at least twelve inches (.3 m) below ground.

(b) Drainage fittings shall be of cast iron, malleable iron, lead, brass, copper, ABS, PVC, vitrified clay, or other approved materials having a smooth interior waterway of the same diameter as the piping served and all such fittings shall be compatible with the type of pipe used.

(1) Fittings on screwed pipe shall be of the recessed drainage type. Burred ends shall be reamed to the full bore of the pipe.

(2) The threads of drainage fittings shall be tapped so as to allow one-fourth inch per foot (20.9 mm/m) grade.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-0401, filed 12/13/91, effective 7/1/92.]

WAC 51-26-0500 Chapter 5—Vents and venting.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-0500, filed 12/13/91, effective 7/1/92.]

WAC 51-26-0503 Materials. Section 503.

(a) Vent pipe shall be cast iron, galvanized steel, galvanized wrought iron, lead, copper, brass, Schedule 40 ABS DWV, Schedule 40 PVC DWV or other approved materials having a smooth and uniform bore except that:

(1) No galvanized wrought iron or galvanized steel pipe shall be used underground and shall be kept at least six inches above ground.

(b) Vent fittings shall be cast iron, galvanized malleable iron or galvanized steel, lead, copper, brass, ABS, PVC, or other approved materials, except that no galvanized malleable iron or galvanized steel fittings shall be used underground and shall be kept at least six inches (152.4 mm) above ground.

(c) Changes in direction of vent piping shall be made by the appropriate use of approved fittings and no such pipe shall be strained or bent. Burred ends shall be reamed to the full bore of the pipe.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-0503, filed 12/13/91, effective 7/1/92.]

WAC 51-26-0909 Section 909—Floor drains and shower stalls. (a) Floor drains shall be considered plumbing fixtures and each such drain shall be provided with an approved type strainer having a waterway equivalent to the area of the tailpiece. Floor drains, floor receptors, and shower drains shall be of an approved type, suitably flanged to provide a watertight joint in the floor.

(b) Shower receptors are plumbing fixtures and shall conform to the general requirements therefore contained in Section 901 of this chapter. Each such shower receptor shall be constructed of vitrified china or earthenware, ceramic tile, porcelain enameled metal, or of such other material as may be acceptable to the Administrative Authority. No shower receptacle shall be installed unless it conforms to acceptable standards as required by Chapter 2 of this Code or until a specification or a prototype or both of such receptor has first been submitted to the Administrative Authority and his approval obtained.

(c) Each shower receptor shall be an approved type and be so constructed as to have a finished dam, curb, or threshold which is at least one (1) inch (25.4 mm) lower than the sides and back of such receptor. In no case shall any dam or threshold be less than two (2) inches (50.8 mm) or more than nine (9) inches (228.6 mm) in depth when measured from the top of the dam or threshold to the top of the drain. The finished floor of the receptor shall slope uniformly from the sides toward the drain not less than one-quarter (1/4) inch per foot (20.9 mm/m), nor more than one-half (1/2) inch per foot (41.8 mm/m). Thresholds shall be of sufficient width to accommodate a minimum 22 inch (558.8 mm) door.

Exception: Special use shower compartments for wheelchair use may eliminate the curb or threshold. The required slope and depth shall be maintained from the door entry to the drain opening. The minimum distance between the door or entry to the drain opening shall be 4 feet (1.2 m).

(d) All shower compartments, regardless of shape, shall have a minimum finished interior of one thousand twenty-four (1024) square inches (0.66 m^2) and shall also be capable of encompassing a thirty (30) inch (762 mm) circle. The minimum required area and dimensions shall be measured at

a height equal to the top of the threshold and at a point tangent to its centerline. The minimum area and dimensions shall be maintained to a point seventy (70) inches (1778 mm) above the shower drain outlet with no protrusions other than the fixture valve or valves, shower head and safety grab bars or rails.

(e) When the construction of on-site built-up shower receptors is permitted by the Administrative Authority, one of the following means shall be employed:

(1) Shower receptors built directly on the ground:

Shower receptors built directly on the ground shall be watertight and shall be constructed from approved type dense, non-absorbent and non-corrosive materials. Each such receptor shall be adequately reinforced, shall be provided with an approved flanged floor drain designed to make a watertight joint in the floor, and shall have smooth, impervious, and durable surfaces.

(2) Shower receptors built above ground:

When shower receptors are built above ground the sub-floor and rough side of walls to a height of not less than three (3) inches (76.2 mm) above the top of the finished dam or threshold shall be first lined with sheet lead or copper* or shall be lined with other durable and watertight materials. All lining materials shall be pitched one-quarter (1/4) inch per foot (20.9 mm/m) to weep holes in the subdrain of a smooth and solidly formed sub-base. All such lining materials shall extend upward on the rough jambs of the shower opening to a point no less than three (3) inches (76.2 mm) above the top of the finished dam or threshold and shall extend outward over the top of the rough threshold and be turned over and fastened on the outside face of both the rough threshold and the jambs.

* Lead and copper sub-pans or linings shall be insulated from all conducting substances other than their connecting drain by fifteen (15) pound (6.8 kg) asphalt felt or its equivalent and no lead pan or liner shall be constructed of material weighing less than four (4) pounds per square foot (19.6 kg/m²). Copper pans or liners shall be at least No. 24 B & S Gauge (0.2 inches) (.5 mm). Joints in lead pans or liners shall be burned. Joints in copper pans or liners shall be soldered or brazed.

Non-metallic shower sub-pans or linings may be built-up on the job site of not less than three (3) layers of standard grade fifteen (15) pound (6.8 kg) asphalt impregnated roofing felt. The bottom layer shall be fitted to the formed sub-base and each succeeding layer thoroughly hot mopped to that below. All corners shall be carefully fitted and shall be made strong and watertight by folding or lapping, and each corner shall be reinforced with suitable webbing hot-mopped in place. All folds, laps, and reinforcing webbing shall extend at least four (4) inches (101.6 mm) in all directions from the corner and all webbing shall be of approved type and mesh, producing a tensile strength of not less than fifty (50) pounds per inch (.9 kg/mm) in either direction. Non-metallic shower sub-pans or linings may also consist of multi-layers of other approved equivalent materials suitably reinforced and carefully fitted in place on the job site as elsewhere required in this section.

Linings shall be properly recessed and fastened to approved backing so as not to occupy the space required for the wall covering and shall not be nailed or perforated at any point which may be less than one (1) inch (25.4 mm) above the finished dam or threshold. An approved type sub-drain shall be installed with every shower sub-pan or lining. Each such sub-drain shall be of the type that sets flush with the sub-base and shall be equipped with a clamping ring or other device to make a tight connection between the lining and the drain. The sub-drain shall have weep holes into the waste line.

All shower lining materials shall conform to approved standards acceptable to the Administrative Authority.

(f) Floors of public shower rooms shall have a non-skid surface and shall be drained in such a manner that waste water from one bather will not pass over areas occupied by other bathers. Gutters in public or gang shower rooms shall have rounded corners for easy cleaning and shall be sloped not less than two (2) percent toward drains. Drains in gutters shall be spaced not more than eight (8) feet (2.4 m) from side walls nor more than sixteen (16) feet (4.9 m) apart.

(g) In the absence of local regulations, showers in all occupancies other than dwelling units served by individual water heaters shall be provided with individual shower control valves of the pressure balance or the thermostatic mixing valve type. Multiple or gang showers may be controlled by a master thermostatic mixing valve in lieu of individually controlled pressure balance or thermostatic mixing valves. Limit stops shall be provided on such valves and shall be adjusted to deliver a maximum 120°F.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-0909, filed 12/21/94, effective 6/30/95.]

WAC 51-26-1000 Chapter 10—Water distribution.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-1000, filed 12/13/91, effective 7/1/92.]

WAC 51-26-1004 Materials. Section 1004.

(a) Water pipe and fittings shall be of brass, copper, cast iron, galvanized malleable iron, galvanized wrought iron, galvanized steel, or other approved materials. Asbestos-cement, CPVC, PB, PE, or PVC water pipe manufactured to recognized standards may be used for cold water distribution systems outside a building. CPVC and PB water pipe and tubing may be used for hot and cold water distribution systems within a building. All materials used in the water supply system, except valves and similar devices shall be of a like material, except where otherwise approved by the administrative authority.

(b) Cast iron fittings up to and including two inches (50.8 mm) in size, when used in connection with potable water piping shall be galvanized.

(c) All malleable iron water fittings shall be galvanized.

(d) Piping and tubing which has previously been used for any purpose other than for potable water systems shall not be used.

(e) Approved plastic materials may be used in water service piping, provided that where metal water service piping is used for electrical grounding purposes, replacement piping therefore shall be of like materials.

EXCEPTION: Where a grounding system, acceptable to the administrative authority is installed, inspected, and approved, metallic pipe may be replaced with nonmetallic pipe.

(f) Solder shall conform to the requirements of section 802(d).

(g) Water pipe and fittings with a lead content which exceeds eight percent shall be prohibited in piping systems used to convey potable water.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-1004, filed 12/13/91, effective 7/1/92.]

WAC 51-26-1007 Section 1007—Water pressure, pressure regulators, and pressure relief valves. (a) Inadequate Water Pressure - Whenever the water pressure in the main or other source of supply will not provide a water pressure of at least fifteen (15) pounds per square inch (103.4 kPa), after allowing for friction and other pressure losses, a tank and a pump or other means which will provide said fifteen (15) pounds per square inch (103.4 kPa) pressure shall be installed.

(b) Excessive Water Pressure - Where local water pressure is in excess of eighty (80) pounds per square inch (551.2 kPa), an approved type pressure regulator preceded by an adequate strainer shall be installed and the pressure reduced to eighty (80) pounds per square inch (551.2 kPa) or less. For potable water services up to and including one and one-half (1-1/2) inch (38.1 mm) regulators, provision shall be made to prevent pressure on the building side of the regulator from exceeding main supply pressure. Approved regulators with integral by-passes are acceptable. Each such regulator and strainer shall be accessibly located and shall have the strainer readily accessible for cleaning without removing the regulator or strainer body or disconnecting the supply piping. All pipe size determinations shall be based on eighty (80) percent of the reduced pressure when using Table 10-2.

(c) Any water system provided with a pressure regulating device or check valve at its source or any water system containing storage water heating equipment shall be provided with an approved, listed, adequately sized pressure relief valve, except for listed non-storage instantaneous heaters having an inside diameter of not more than three (3) inches.

In addition to the required pressure relief valve, an approved, listed expansion tank or other device designed for intermittent operation for thermal expansion control shall be installed whenever the building supply pressure is greater than the required relief valve pressure setting or when any device is installed that prevents pressure relief through the building supply. The tank or device shall be sized in accordance with the manufacturer's recommendation.

(d) Each pressure relief valve shall be an approved automatic type with drain, and each such relief valve shall be set at a pressure of not more than one hundred fifty (150) pounds per square inch (1033.5 kPa).

(e) Relief valves located inside a building shall be provided with a drain, not smaller than the relief valve outlet, of galvanized steel, hard drawn copper piping and fittings, CPVC or PB with fittings which will not reduce the internal bore of the pipe or tubing (straight lengths as opposed to coils) and shall extend from the valve to the outside of the building with the end of the pipe not more than two (2) feet (.6 m) nor less than six (6) inches (152.4 mm) above the ground and pointing downward. Such drains may terminate at other approved locations. No part of such drain pipe shall be trapped and the terminal end of the drain pipe shall not be threaded.

(f) Any water heating device connected to a separate storage tank and having valves between said heater and tank shall be provided with an approved water pressure relief valve.

(g) Nothing contained herein shall prevent the use of an approved combination temperature and pressure relief valve. Each such approved combination temperature and pressure relief valve shall be installed on the water heating device in an approved location based on its listing requirements and the manufacturer's instructions. Each such combination temperature and pressure relief valve shall be provided with a drain as required in subsection (e) of this section.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-1007, filed 12/21/94, effective 6/30/95.]

WAC 51-26-1009 Section 1009—Size of potable water piping. (a) The size of each water meter and each potable water supply pipe from the meter or other source of supply to the fixture supply branches, risers, fixtures, connections, outlets, or other uses shall be based on the total demand and shall be determined according to the methods and procedures outlined in this section.

(b) Whenever a water filter, water softener or similar water treating device, backflow prevention device, or similar device is installed in any water supply line, the pressure loss through such devices must be included in the pressure loss calculations of the system, and the water supply pipe and meter shall be adequately sized to provide for any such pressure loss.

No water filter, water softener, backflow prevention device, or similar device regulated by this Code shall be installed in any potable water supply piping when the diameter of the inlet or outlet of any such device or its connecting piping is less than the diameter of such water supply piping, or when the installation of such device produces an excessive pressure drop in any such water supply piping.

All such devices shall be of a type approved by the Administrative Authority and shall be tested for flow rating and pressure loss by an approved laboratory or recognized testing agency to standards consistent with the intent of this chapter. The maximum rated flow and the pressure loss shall be stamped legibly on the device or on a metal label, permanently attached to the device, and shall be in the following form:

MAXIMUM PRESSURE DROP

Flow Gallons per minute	Liters per second	Pressure Drop Pounds per square inch
5	.32	- - (kPa)
10	.63	- - (kPa)
15	.95	- - (kPa)

Note: The final figure in the flow rate column shall be the maximum rated flow or capacity of the device.

(c) The quantity of water required to be supplied to every plumbing fixture shall be represented by fixture units, as shown in Table 10-1. Equivalent fixture values shown in Table 10-1 include both hot and cold water demand.

(d) Where the maximum length of supply piping is two hundred (200) feet (60.8 m) or less, each water piping system of fifty (50) fixture units or less shall be sized in accordance with the values set forth in Table 10-2 of this section. Other systems of more than fifty (50) fixture units and within the range of Table 10-2 may be sized from that table or by the method set forth in subsection (f) of this section.

(e) Listed engineered parallel water distribution systems may be installed in accordance with their listing.

(f) Except as provided in subsection (d) of this section, the size of each water piping system shall be determined in accordance with the procedure set forth in Appendix A of this Code (Recommended Rules for Sizing the Water Supply System).

(g) Except where the type of pipe used and the water characteristics are such that no decrease in capacity due to length of service (age of system) may be expected, all friction loss data shall be obtained from the "Fairly Rough" or "Rough" charts in Appendix A of this Code. Friction or pressure losses in water meter, valve and fittings shall be obtained from the same sources. Pressure losses through water treating equipment, backflow prevention devices, or other flow restricting devices shall be computed as required by subsection (b) of this section.

(h) On any proposed water piping installation sized using Table 10-2, the following conditions shall be determined:

(1) Total number of fixture units as determined from the table of Equivalent Fixture Units (Table 10-1) for the fixtures to be installed.

(2) Developed length of supply pipe from meter to most remote outlet.

(3) Difference in elevation between the meter or other source of supply and the highest fixture or outlet.

(4) Pressure in the street main or other source of supply at the locality where the installation is to be made.

(5) In localities where there is a fluctuation of pressure in the main throughout the day, the water piping systems shall be designed on the basis of the minimum pressure available.

(i) **Size of Meter and Building Supply Pipe Using Table 10-2.** Knowing the available pressure at the water meter or other source of supply, and after subtracting one-half (1/2) pound per square inch pressure for each foot (11.3 kPa/m) of difference in elevation between such source of supply and highest water supply outlet in the building or on the premises, use the "Pressure Range" group within which this pressure will fall. Select the "length" column which is equal to or longer than the required length. Follow down the column to a fixture unit value equal to or greater than the total number of fixture units required by the installation. Having located the proper fixture unit value for the required length, sizes of meter and building supply pipe will be found in the two left-hand columns.

No building supply pipe shall be less than three-quarter (3/4) inch (919.1 mm) in diameter.

(j) **Size of Branches.** The size of each branch shall be determined by the number of fixture units to be served by that branch, following the methods outlined in subsection (i) of this section.

(k) **Sizing for Flushometer Valves.** Branches and mains serving water closet or similar flushometer valves may be sized from Table 10-2 when the following values are assigned to each flushometer valve beginning with the most remote valve on each branch.

For the first flushometer valve	40 fixture units
For the second flushometer valve	30 fixture units
For the third flushometer valve	20 fixture units
For the fourth flushometer valve	15 fixture units
For the fifth flushometer valve	10 fixture units

Flushometer valves with an assigned value of five (5) fixture units given in Table 10-1 may be computed at half (1/2) the above values assigned, but in no case less than five (5) fixture units. After the fifth valve on any branch or main, subsequent fixture unit loading may be computed using the value of the fifth flushometer. Piping supplying a flushometer valve shall not be less in size than the valve inlet.

Note: Any system using flushometer valves may be sized by the procedures set forth in subsection (f) of this section.

(l) **Sizing Systems for Flushometer Tanks.** The size of branches and mains serving flushometer tanks shall be consistent with the sizing procedures for flush tank water closets.

(m) **Sizing Systems With Hot Water Piping.** In sizing a water piping system having a total demand of fifty (50) fixture units or less, the greatest developed length of the cold water supply piping may be used (from Table 10-2) and the length of the hot water piping ignored when the hot water piping friction loss is compensated for by the following method:

(1) Compute the total hot water fixture unit demand, using those values given in Table 10-1 for the combined hot and cold water use.

(2) Assign the total demand computed as required in (1) above, as the fixture unit demand at the hot water heater inlet.

(3) Starting at the most remote outlet on the cold water piping and working back toward the water meter, compute the pipe sizing for the system from the column originally selected in Table 10-2, using the fixture unit values given in Table 10-1, and adding in the fixture unit demand of the hot water heater supply inlet as computed in (1) above, at the point where it occurs. The final size of the cold water branch or main need not exceed the originally established size of the building supply.

(n) Except as provided in subsection (m), water piping systems may be designed by taking the total length of the supply piping from the source of cold water supply through the water heater, to the most remote hot water outlet and assessing flow values of seventy-five (75) percent of the combined hot and cold water demand as given in Table 10-1, to the piping supplying either hot or cold water to those fixtures served by both. Piping serving water heaters shall be sized to deliver the above required hot water demand, plus all required cold water demands, but in no case need the piping be larger in size than that required by Table 10-2 for the total building supply.

(o) **Exceptions.** The provisions of this section relative to size of water piping need not apply to the following:

(1) Water supply piping systems designed in accordance with recognized engineering procedures acceptable to the Administrative Authority.

(2) Alteration of or minor additions to existing installations, provided the Administrative Authority finds that there will be a reasonably adequate supply of water for all fixtures.

(3) Replacement of existing fixtures or appliances.

(4) Piping which is part of fixture equipment.

(5) Unusual conditions where, in the judgment of the Administrative Authority, a reasonably adequate supply of water is provided.

(6) Non-potable water lines as defined in subsection (r) of Section 1003.

(7) The size and material of irrigation water piping installed outside of any building or structure and separated from the potable water supply by means of an approved airgap or backflow prevention device is not regulated by this Code. The potable water piping system supplying each such irrigation system shall be adequately sized as required elsewhere in this chapter to deliver the full connected demand of both systems.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-1009, filed 12/21/94, effective 6/30/95.]

WAC 51-26-1020 Section 1020—Table 10-1.

TABLE 10-1
Equivalent Fixture Units
(Includes Combined Hot and Cold Water Demand)

Fixture	Number of Fixture Units: Private Use	Public Use
Bar sink	1	2
Bathtub (with or without shower over)	2	4
Bidet	2	4
Dental unit or cuspidor	–	1
Drinking fountain (each head)	1	2
Hose bibb or sill cock (standard type)	3	5
Mobile home (each)	6	6
Laundry tub or clotheswasher (each pair of faucets)	2	4
Lavatory	1	2
Lavatory (dental)	1	1
Lawn sprinklers (standard type, each head)	1	1
Shower (each head)	2	4
Sink (bar)	1	2
Sink or dishwasher	2	4
Sink (flushing rim, clinic)	–	10
Sink (washup, each set of faucets)	–	2
Sink (washup, circular spray)	–	4
Urinal (pedestal or similar type)	–	10
Urinal (stall)	–	5
Urinal (wall)	–	5
Urinal (flush tank)	–	3
Water closet (flush tank)	3	5
Water closet (flushometer-tank)	3	5
*Water closet (flushometer valve)	*	*
Water supply outlets for items not listed above shall be computed at their maximum demand, but in no case less than:		
3/8 inch (9.5 mm)	1	2
1/2 inch (12.7 mm)	2	4
3/4 inch (19.1 mm)	3	6
1 inch (25.4 mm)	6	10

Revise footnote to read as follows:

* See subsection (k) of Section 1009 for method of sizing flushometer valve installations using Table 10-2.

Revise footnote to read as follows:

* See subsection (k) of Section 1009 for method of sizing flushometer valve installations using Table 10-2.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-1020, filed 12/21/94, effective 6/30/95.]

WAC 51-26-1301 General. Section 1301—General.

The regulation of this chapter shall govern the construction, location, and installation of all fuel burning and other water heaters heating potable water, together with all chimneys, vents, and their connectors. All design, construction, and workmanship shall be in conformity with accepted engineering practices and shall be of such character as to secure the results sought to be obtained by this Code. No water heater shall be hereinafter installed which does not comply in all respects with the type and model of each size thereof approved by the Administrative Authority. (For the convenience of users of this Code, a list of generally accepted gas equipment standards is included at the end of Chapter 2 of this Code in Table A.)

Any water system containing storage water heating equipment shall be provided with an approved, listed, adequately sized combination pressure and temperature relief valve, except for listed non-storage instantaneous heaters having an inside diameter of not more than three (3) inches. Each such approved combination pressure and temperature relief valve shall be installed on the water heating device in an approved location based on its listing requirements and the manufacturer's instructions. Each such combination pressure and temperature relief valve shall be provided with a drain as required in Section 1007(e) of the U.P.C. A new listed and approved combination pressure and temperature relief valve shall be installed on all water storage heater equipment replacements.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-1301, filed 12/21/94, effective 6/30/95.]

WAC 51-26-1800 Chapter 18—Water conservation performance standards.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-1800, filed 12/13/91, effective 7/1/92.]

WAC 51-26-1801 Declaration of purpose. Sec. 1801. The purpose of this chapter shall be to implement water conservation performance standards in accordance with RCW 19.27.170.

[Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1801, filed 12/23/92, effective 7/1/93. Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-1801, filed 12/13/91, effective 7/1/92.]

WAC 51-26-1802 Application. Sec. 1802. This chapter shall apply to all new construction and all remodeling involving replacement of plumbing fixtures and fittings in all residential, hotel, motel, school, industrial, commercial use, or other occupancies determined by the council to use significant quantities of water. Plumbing fixtures, fittings and appurtenances shall conform to the standards specified in this chapter and shall be provided with an adequate supply of potable water to flush and keep the fixtures in a clean and sanitary condition without danger of backflow or cross-connection.

[Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1802, filed 12/23/92, effective 7/1/93. Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-1802, filed 12/13/91, effective 7/1/92.]

WAC 51-26-1803 Water efficiency standards. Sec. 1803. (a) Standards for Vitreous China Plumbing Fixtures. 1. The following standards shall be adopted as plumbing materials, performance standards, and labeling standards for water closets and urinals. Water closets and urinals shall meet either the ANSI/ASME standards or the CSA standard.

ANSI/ASME A112.19.2M-1990	Vitreous China Plumbing Fixtures
ANSI/ASME A112.19.6-1990	Hydraulic Requirements for Water Closets and Urinals
CSA B45	CSA Standards on Plumbing Fixtures

2. The maximum water use allowed in gallons per flush (gpf) or liters per flush (lpf) for any of the following water closets shall be the following:

Tank-type toilets	1.6 gpf/6.0 lpf
Flushometer-valve toilets	1.6 gpf/6.0 lpf
Flushometer-tank toilets	1.6 gpf/6.0 lpf
Electromechanical hydraulic toilets	1.6 gpf/6.0 lpf

EXCEPTIONS:
1. Water closets located in day care centers, intended for use by young children, may have a maximum water use of 3.5 gallons per flush or 13.25 liters per flush.
2. Water closets with bed pan washers may have a maximum water use of 3.5 gallons per flush or 13.25 liters per flush.
3. Blow out bowls, as defined in ANSI/ASME A112.19.2M, Section 5.1.2.3 may have a maximum water use of 3.5 gallons per flush or 13.25 liters per flush.

3. The maximum water use allowed for any urinal shall be 1.0 gallons per flush or 3.78 liters per flush.

4. No urinal or water closet that operates on a continuous flow or continuous flush basis shall be permitted.

5. This section does not apply to fixtures installed before the effective date of this chapter, that are removed and relocated to another room or area of the same building after the effective date of this chapter.

(b) Standards for Plumbing Fixture Fittings. 1. The following standards are adopted as plumbing material, performance requirements, and labeling standards for plumbing fixture fittings. Faucets, aerators, and shower heads shall meet either the ANSI/ASME standard or the CSA standard.

ANSI/ASME A112.18.1M-1989	Plumbing Fixture Fittings
CSA B125	Plumbing Fittings

2. The maximum water use allowed for any shower head is 2.5 gallons per minute or 9.5 liters per minute.

EXCEPTION: Emergency use showers shall be exempt from the maximum water usage rates.

3. The maximum water use allowed in gallons per minute (gpm) or liters per minute (lpm) for any of the following faucets and replacement aerators is the following:

Lavatory faucets	2.5 gpm/9.5 lpm
Kitchen faucets	2.5 gpm/9.5 lpm
Replacement aerators	2.5 gpm/9.5 lpm
Public lavatory faucets other than metering	0.5 gpm/1.9 lpm

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-1803, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1803, filed 12/23/92, effective 7/1/93. Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-1803, filed 12/13/91, effective 7/1/92.]

WAC 51-26-1804 Metering valves. Sec. 1804. Lavatory faucets located in restrooms intended for use by the general public shall be equipped with a metering valve designed to close by spring or water pressure when left unattended (self-closing).

EXCEPTION: 1. Where designed and installed for use by persons with a disability.
2. Where installed in day care centers, for use primarily by children under the age of 6 years of age.

[Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1804, filed 12/23/92, effective 7/1/93. Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-1804, filed 12/13/91, effective 7/1/92.]

WAC 51-26-1810 Reserved.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-1810, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1810, filed 12/23/92, effective 7/1/93.]

WAC 51-26-1820 Reserved.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-1820, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1820, filed 12/23/92, effective 7/1/93.]

WAC 51-26-1830 Accepted plumbing fixtures and fixture fittings. Sec. 1830. Plumbing fixtures and fixture fittings which are tested in accordance with the standards listed herein and listed by either the International Association of Plumbing and Mechanical Officials or the Canadian Standards Association may be approved by the Administrative Authority for installation. Under Section 201, the Administrative Authority may approve plumbing fixtures and fixture fittings, not listed by either the International Association of Plumbing and Mechanical Officials or the Canadian Standards Association, *Provided* the products meet the testing, and marking and labeling requirements listed in WAC 51-26-1803.

The State Building Code Council will publish and distribute a current list of fixtures and fixture fittings that meet the standards listed within Chapter 18 and have been listed with either the International Association of Mechanical and Plumbing Officials or the Canadian Standards Association.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-1830, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1830, filed 12/23/92, effective 7/1/93.]

WAC 51-26-1840 Implementation. Sec. 1840. (a) The standards for water efficiency and labeling contained within WAC 51-26-1803, 51-26-1810, and 51-26-1820 shall be in effect as of July 1, 1993, as provided in RCW 19.27.170.

(b) No individual, public or private corporation, firm, political subdivision, government agency, or other legal entity, may, for purposes of use in the state of Washington, distribute, sell, offer for sale, import, install, or approve for installation any plumbing fixtures or fittings unless the fixtures or fittings meet the standards as provided for in this chapter.

[Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1840, filed 12/23/92, effective 7/1/93.]

WAC 51-26-1845 Amendments. Sec. 1845. The water conservation performance standards contained within this chapter supersede all local government codes. Towns and counties shall not amend the code revisions and standards established herein.

[Statutory Authority: RCW 19.27.170. 93-01-164, § 51-26-1845, filed 12/23/92, effective 7/1/93.]

WAC 51-26-2200 Chapter 22—Minimum plumbing facilities. **WAC 51-26-2200 MINIMUM PLUMBING FACILITIES Table 29-A -MINIMUM PLUMBING FIXTURES** is located in Chapter 29 of the Uniform Building Code, as adopted in WAC 51-30-2900.

[Statutory Authority: Chapter 19.27 RCW. 95-01-124, § 51-26-2200, filed 12/21/94, effective 6/30/95. Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-2200, filed 12/13/91, effective 7/1/92.]

WAC 51-26-2300 Chapter 23—Rainwater systems.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-2300, filed 12/13/91, effective 7/1/92.]

WAC 51-26-2301 D1 materials. (a) Rainwater piping placed within the interior of a building or run within a vent or shaft shall be of cast iron, galvanized steel, wrought iron, brass, copper, lead, Schedule 40 ABS DWV, Schedule 40 PVC DWV or other approved materials.

(b) Rainwater piping located on the exterior of a building shall be not less than 26 ga. galvanized sheet metal. When the conductor is connected to a building storm drain or storm sewer, a drain connection shall be extended above the finished grade and jointed at a point protected from injury.

(c) Rainwater piping located underground within a building shall be of service weight cast iron soil pipe, Type DWV copper tube, Schedule 40 ABS DWV, Schedule 40 PVC DWV, extra strength vitrified clay pipe, or other approved materials.

(d) Rainwater piping commencing two feet (.6 m) from the exterior of a building may be of any approved material permitted in the installation requirements of this code.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-066, § 51-26-2301, filed 12/13/91, effective 7/1/92.]

Chapter 51-27 WAC

STATE BUILDING CODE ADOPTION OF THE 1991 EDITION OF THE UNIFORM PLUMBING CODE STANDARDS

WAC

WAC 51-27-001 Authority. These rules are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-001, filed 12/13/91, effective 7/1/92.]

WAC 51-27-002 Purpose. The purpose of these rules is to implement the provisions of chapter 19.27 RCW, which provides that the state building code council shall maintain the State Building Code in a status which is consistent with the purpose as set forth in RCW 19.27.020. In maintaining the codes, the council shall regularly review updated versions of the codes adopted under the act, and other pertinent information, shall amend the codes as deemed appropriate by the council.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-002, filed 12/13/91, effective 7/1/92.]

WAC 51-27-003 Uniform Plumbing Code standards. The 1991 edition of the Uniform Plumbing Code Standards, published by the International Association of Plumbing and Mechanical Officials is hereby adopted by reference.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-003, filed 12/13/91, effective 7/1/92.]

WAC 51-27-004 Exceptions. The exceptions and amendments to the uniform codes contained in the provisions of chapter 19.27 RCW shall apply in cases of conflict with any of the provisions of these rules.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-004, filed 12/13/91, effective 7/1/92.]

WAC 51-27-008 Implementation. The Uniform Plumbing Code standards adopted by chapter 51-27 WAC shall become effective in all counties and cities of this state on July 1, 1992, unless local amendments have been approved by the state building code council.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-008, filed 12/13/91, effective 7/1/92.]

Chapter 51-30 WAC
STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1994 EDITION OF THE UNIFORM BUILDING CODE
(Formerly chapters 51-20 and 51-21 WAC)

WAC

WAC 51-27-001 Authority. These rules are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-001, filed 12/13/91, effective 7/1/92.]

WAC 51-27-002 Purpose. The purpose of these rules is to implement the provisions of chapter 19.27 RCW, which provides that the state building code council shall maintain the State Building Code in a status which is consistent with the purpose as set forth in RCW 19.27.020. In maintaining the codes, the council shall regularly review updated versions of the codes adopted under the act, and other pertinent information, shall amend the codes as deemed appropriate by the council.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-002, filed 12/13/91, effective 7/1/92.]

WAC 51-27-003 Uniform Plumbing Code standards. The 1991 edition of the Uniform Plumbing Code Standards, published by the International Association of Plumbing and Mechanical Officials is hereby adopted by reference.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-003, filed 12/13/91, effective 7/1/92.]

WAC 51-27-004 Exceptions. The exceptions and amendments to the uniform codes contained in the provisions of chapter 19.27 RCW shall apply in cases of conflict with any of the provisions of these rules.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-004, filed 12/13/91, effective 7/1/92.]

WAC 51-27-008 Implementation. The Uniform Plumbing Code standards adopted by chapter 51-27 WAC shall become effective in all counties and cities of this state on July 1, 1992, unless local amendments have been approved by the state building code council.

[Statutory Authority: RCW 19.27.074, 19.27.031 and chapter 19.27 RCW. 92-01-067, § 51-27-008, filed 12/13/91, effective 7/1/92.]

Chapter 51-30 WAC
STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1994 EDITION OF THE UNIFORM BUILDING CODE
(Formerly chapters 51-20 and 51-21 WAC)

WAC

WAC 51-30-001 Authority. These rules are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-001, filed 12/21/94, effective 6/30/95.]

WAC 51-30-002 Purpose. The purpose of these rules is to implement the provisions of chapter 19.27 RCW, which provides that the State Building Code Council shall maintain the State Building Code in a status which is consistent with the purpose as set forth in RCW 19.27.020. In maintaining the codes the Council shall regularly review updated versions of the codes adopted under the act, and other pertinent information, and shall amend the codes as deemed appropriate by the Council.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-002, filed 12/21/94, effective 6/30/95.]

WAC 51-30-003 Uniform Building Code. The 1994 edition of the Uniform Building Code as published by the International Conference of Building Officials and available from the International Conference of Building Officials, 5360 Workman Mill Road, Whittier, California 90601 is hereby adopted by reference with the following additions, deletions, and exceptions.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-003, filed 12/21/94, effective 6/30/95.]

WAC 51-30-004 Conflicts with Washington State Ventilation and Indoor Air Quality Code. In the case of conflict between the ventilation requirements of Chapter 12 of this code and the ventilation requirements of chapter 51-13 WAC, the Washington State Ventilation and Indoor Air Quality Code, the provisions of the ventilation and indoor air quality code shall govern.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-004, filed 12/21/94, effective 6/30/95.]

WAC 51-30-005 Uniform Building Code requirements for barrier-free accessibility. Chapter 11 and other Uniform Building Code requirements for barrier-free access are adopted pursuant to chapters 70.92 and 19.27 RCW.

Pursuant to RCW 19.27.040, Chapter 11 and requirements affecting barrier-free access in Sections 1004.1, 1004.2, 1004.8, 1004.9, 1006.3, 1006.7, 1006.9, 1006.16, 1007.4, 1007.5, shall not be amended by local governments.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-005, filed 12/21/94, effective 6/30/95.]

WAC 51-30-007 Exceptions. The exceptions and amendments to the Uniform Building Code contained in the provisions of chapter 19.27 RCW shall apply in case of conflict with any of the provisions of these rules.

Table 10-B, Section 1607 and Section 3003 - Special Provisions of the 1994 Uniform Building Code are not adopted.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-007, filed 12/21/94, effective 6/30/95.]

WAC 51-30-008 Implementation. The Uniform Building Code adopted under chapter 51-30 WAC shall become effective in all counties and cities of this state on June 30, 1995.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-008, filed 12/21/94, effective 6/30/95.]

WAC 51-30-009 Recyclable materials and solid waste storage. For the purposes of this section, the following definition shall apply:

RECYCLED MATERIALS means those solid wastes that are separated for recycling or reuse, such as papers, metals and glass.

All local jurisdiction shall require that space be provide for the storage of recycled materials and solid waste for all new buildings.

EXCEPTIONS: Group R, Division 3 and Group U Occupancies.

The storage area shall be designed to meet the needs of the occupancy, efficiency of pickup, and shall be available to occupants and haulers.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-009, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0100 Chapter 1—Administration.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0100, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0104 Section 104—Organization and enforcement.

104.1 Creation of Enforcement Agency. There is hereby established in this jurisdiction a code enforcement agency which shall be under the administrative and operational control of the building official.

104.2 Powers and Duties of Building Official.

104.2.1 General. The building official is hereby authorized and directed to enforce all the provisions of this code. For such purposes, the building official shall have the powers of a law enforcement officer.

The building official shall have the power to render interpretations of this code and to adopt and enforce rules and supplemental regulations in order to clarify the application of its provisions. Such interpretations, rules and regulations shall be in conformance with the intent and purpose of this code.

104.2.2 Deputies. In accordance with prescribed procedures and with the approval of the appointing authority, the building official may appoint such number of technical officers and inspectors and other employees as shall be authorized from time to time. The building official may deputize such inspectors or employees as may be necessary to carry out the functions of the code enforcement agency.

104.2.3 Right of entry. When it is necessary to make an inspection to enforce the provisions of this code, or when the building official has reasonable cause to believe that there exists in a building or upon a premises a condition which is contrary to or in violation of this code which makes the building or premises unsafe, dangerous or hazardous, the building official may enter the building or premises at reasonable times to inspect or to perform the duties imposed by this code, provided that if such building or premises be occupied that credentials be presented to the occupant and entry requested. If such building or premises be unoccupied, the building official shall first make a reasonable effort to locate the owner or other person having charge or control of the building or premises and request entry. If entry is refused, the building official shall have recourse to the remedies provided by law to secure entry.

104.2.4 Stop orders. Whenever any work is being done contrary to the provisions of this code, or other pertinent laws or ordinances implemented through the enforcement of this code, the building official may order the work stopped by notice in writing served on any persons engaged in the doing or causing such work to be done, and any such persons shall forthwith stop such work until authorized by the building official to proceed with the work.

104.2.5 Occupancy violations. Whenever any building or structure or equipment therein regulated by this code is being used contrary to the provisions of this code, the building official may order such use discontinued and the structure, or portion thereof, vacated by notice served on any person causing such use to be continued. Such person shall discontinue the use within the time prescribed by the building official after receipt of such notice to make the structure, or portion thereof, comply with the requirements of this code.

104.2.6 Liability. The building official charged with the enforcement of this code, acting in good faith and without malice in the discharge of the duties required by this code or other pertinent law or ordinance shall not thereby be rendered personally liable for damages that may accrue to persons or property as a result of an act or by reason of an act or omission in the discharge of such duties. A suit brought against the building official or employee because of such an act or omission performed by the building official or employee in the enforcement of any provision of such codes or other pertinent laws or ordinances implemented though the enforcement of this code or enforced by the code enforcement agency shall be defended by this jurisdiction until final termination of such proceedings, and any judgment resulting therefrom shall be assumed by this jurisdiction.

This code shall not be construed to relieve from or lessen the responsibility of any person owning, operating or controlling any building or structure for any damages to persons or property caused by defects, nor shall the code enforcement agency or its parent jurisdiction be held as assuming any such liability by reason of the inspections authorized by this code or any permits or certificates issued under this code.

104.2.7 Modifications. When there are practical difficulties involved in carrying out the provisions of this code, the building official may grant modifications for individual cases. The building official shall first find that a special individual reason makes the strict letter of this code impractical and that the modification is in conformance with the intent and purpose of this code and that such modification

does not lessen any fire-protection requirements or any degree of structural integrity. The details of any action granting modifications shall be recorded and entered in the files of the code enforcement agency.

104.2.8 Alternate materials, methods of design and methods of construction. The provisions of this code are not intended to prevent the use of any material, method of design or method of construction not specifically prescribed by this code, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of this code and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

104.2.9 Tests. Whenever there is insufficient evidence of compliance with any of the provisions of this code or evidence that any material or construction does not conform to the requirements of this code, the building official may require tests as proof of compliance to be made at no expense to this jurisdiction.

Test methods shall be as specified by this code or by other recognized test standards. If there are no recognized and accepted test methods for the proposed alternate, the building official shall determine test procedures.

All tests shall be made by an approved agency. Reports of such tests shall be retained by the building official for the period required for the retention of public records.

104.2.10 Cooperation of other officials and officers. The building official may request, and shall receive, the assistance and cooperation of other officials of this jurisdiction so far as is required in the discharge of the duties required by this code or other pertinent law or ordinance.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0104, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0200 Chapter 2—Definitions and abbreviations.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0200, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0204 Section 204—C.

CAST STONE is a precast building stone manufactured from portland cement concrete and used as a trim, veneer or facing on or in building or structures.

CENTRAL HEATING PLANT is environmental heating equipment which directly utilizes fuel to generate heat in a medium for distribution by means of ducts or pipes to areas other than the room or space in which the equipment is located.

C.F.R. is the Code of Federal Regulations, a regulation of the United States of America available from the Superintendent of Documents, United States Government Printing Office, Washington, D.C. 20402.

CHIEF OF THE FIRE DEPARTMENT is the head of the fire department or a regularly authorized deputy.

CHILD DAY CARE, shall, for the purposes of these regulations, mean the care of children during any period of a 24 hour day.

CHILD DAY CARE HOME, FAMILY is a child day care facility, licensed by the state, located in the family abode of the person or persons under whose direct care and supervision the child is placed, for the care of twelve or fewer children, including children who reside at the home.

COMBUSTIBLE LIQUID. See the Fire Code.

CONGREGATE RESIDENCE is any building or portion thereof which contains facilities for living, sleeping and sanitation, as required by this code, and may include facilities for eating and cooking, for occupancy by other than a family. A congregate residence may be a shelter, convent, monastery, dormitory, fraternity or sorority house but does not include jails, hospitals, nursing homes, hotels or lodging houses.

CONDOMINIUM, RESIDENTIAL. See "apartment house".

CONTROL AREA is a building or portion of a building within which the exempted amounts of hazardous materials may be stored, dispensed, handled or used.

CORROSIVE is a chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. A chemical is considered to be corrosive if, when tested on the intact skin of albino rabbits by the method described in the United States Department of Transportation in Appendix A to 49 C.F.R. 173, it destroys or changes irreversibly the structure of the tissue at the site of contact following an exposure period of four hours. This term shall not refer to action on inanimate surfaces.

COURT is a space, open and unobstructed to the sky, located at or above grade level on a lot and bounded on three or more sides by walls of a building.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0204, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0207 Section 207—F.

FABRICATION AREA (fab area) is an area within a Group H, Division 6 Occupancy in which there are processes involving hazardous production materials and may include ancillary rooms or areas such as dressing rooms and offices that are directly related to the fab area processes.

FAMILY is an individual or two or more persons related by blood or marriage or a group of not more than five persons (excluding servants) who need not be related by blood or marriage living together in a dwelling unit.

FAMILY ABODE means a single dwelling unit and accessory buildings occupied for living purposes by a family

which provides permanent provisions for living, sleeping, eating, cooking, and sanitation.

FIRE ASSEMBLY. See Section 713.2.

FIRE CODE is the *Uniform Fire Code* promulgated by the International Fire Code Institute, as adopted by this jurisdiction.

FIRE RESISTANCE or **FIRE-RESISTIVE CONSTRUCTION** is construction to resist the spread of fire, details of which are specified in this code.

FIRE-RETARDANT-TREATED WOOD is any wood product impregnated with chemicals by a pressure process or other means during manufacture, and which, when tested in accordance with U.B.C. Standard 8-1 for a period of 30 minutes, shall have a flame spread of not over 25 and show no evidence of progressive combustion. In addition, the flame front shall not progress more than 10½ feet (3200 mm) beyond the center line of the burner at any time during the test. Materials which may be exposed to the weather shall pass the accelerated weathering test and be identified as Exterior type, in accordance with U.B.C. Standard 23-5. Where material is not directly exposed to rainfall but exposed to high humidity conditions, it shall be subjected to the hygroscopic test and identified as Interior Type A in accordance with U.B.C. Standard 23-5.

All materials shall bear identification showing the fire performance rating thereof. Such identifications shall be issued by an approved agency having a service for inspection of materials at the factory.

FLAMMABLE LIQUID. See the Fire Code.

FLOOR AREA is the area included within the surrounding exterior walls of a building or portion thereof, exclusive of vent shafts, courts and gridirons. The floor area of a building, or portion thereof, not provided with surrounding exterior wall shall be the usable area under the horizontal projection of the roof or floor above.

FM is Factory Mutual Engineering and Research, 1151 Boston-Providence Turnpike, Norwood, Massachusetts 02062.

FOAM PLASTIC INSULATION is a plastic which is intentionally expanded by the use of a foaming agent to produce a reduced-density plastic containing voids consisting of hollow spheres or interconnected cells distributed throughout the plastic for thermal insulating or acoustical purposes and which has a density less than 20 pounds per cubic foot (320 kg/m^3).

FOOTING is that portion of the foundation of a structure which spreads and transmits loads directly to the soil or the piles.

FRONT OF LOT is the front boundary line of a lot bordering on the street and, in the case of a corner lot, may be either frontage.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0207, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0217 Section 217—P.

PANIC HARDWARE. See Section 1001.2.

PEDESTRIAN WALKWAY is a walkway used exclusively as a pedestrian trafficway.

PENETRATION FIRE STOP is a through-penetration fire stop or a membrane-penetration fire stop.

PERMIT is an official document or certificate issued by the building official authorizing performance of a specified activity.

PERSON is a natural person, heirs, executors, administrators or assigns, and also includes a firm, partnership or corporation, its or their successors or assigns, or the agent of any of the aforesaid.

PHOTOLUMINESCENT is the property of emitting light as the result of absorption of visible of invisible light, which continues for a length of time after excitation.

PLASTIC MATERIALS, APPROVED, other than foam plastics regulated under Sections 601.5.5 and 2602, are those plastic materials having a self-ignition temperature of 650°F. (343°C.) or greater as determined in accordance with U.B.C. Standard 26-6, and a smoke-density rating not greater than 450 when tested in accordance with U.B.C. Standard 8-1, in the way intended for use, or a smoke-density rating not greater than 75 when tested in accordance with U.B.C. Standard 26-5 in the thickness intended for use. Approved plastics shall be classified as either CC1 or CC2 in accordance with U.B.C. Standard 26-7. See also Section 207, definition of "foam plastic insulation".

PLATFORM. See Section 407.

PLUMBING CODE is the *Plumbing Code*, as adopted by this jurisdiction.

PORTABLE SCHOOL CLASSROOM is a structure, transportable in one or more sections, which requires a chassis to be transported, and is designed to be used as an educational space with or without a permanent foundation. The structure shall be trailerable and capable of being demounted and relocated to other locations as needs arise.

PROTECTIVE MEMBRANE is the surface material which forms the required outer layer or layers of a fire-resistive assembly containing concealed spaces.

PUBLIC WAY See Section 1001.2.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0217, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0220 Section 220—S.

SELF-LUMINOUS means powered continuously by a self-contained power source other than battery or batteries, such as radioactive tritium gas. A self-luminous sign is independent of external power supplies or other energy for its operation.

SENSITIZER is a chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

SERVICE CORRIDOR is a fully enclosed passage used for transporting hazardous production materials and for purposes other than required exiting.

SHAFT is an interior space, enclosed by walls or construction, extending through one or more stories or basements which connects openings in successive floors, or floors and roof, to accommodate elevators, dumbwaiters, mechanical equipment or similar devices or to transmit light or ventilation air.

SHAFT ENCLOSURE is the walls or construction forming the boundaries of a shaft.

SHALL, as used in this code, is mandatory.

SMOKE DETECTOR is an approved, listed device that senses visible or invisible particles of combustion.

STAGE. See Chapter 4.

STORY is that portion of a building included between the upper surface of any floor and the upper surface of the floor next above, except that the topmost story shall be that portion of a building included between the upper surface of the topmost floor and the ceiling or roof above. If the finished floor level directly above a usable or unused underfloor space is more than 6 feet (1829 mm) above grade as defined herein for more than 50 percent of the total perimeter or is more than 12 feet (3658 mm) above grade as defined herein at any point, such usable or unused underfloor space shall be considered as a story.

STORY, FIRST, is the lowest story in a building which qualifies as a story, as defined herein, except that a floor level in a building having only one floor level shall be classified as a first story, provided such floor level is not more than 4 feet (1219 mm) below grade, as defined herein, for more than 50 percent of the total perimeter, or not more than 8 feet (2438 mm) below grade, as defined herein, at any point.

STREET is any thoroughfare or public way not less than 16 feet (4877 mm) in width which has been dedicated or deeded to the public for public use.

STRUCTURAL OBSERVATION means the visual observation of the structural system, for general conformance to the approved plans and specifications. Structural observation does not include or waive the responsibility for the inspections required by Sections 108 and 1702 or other sections of the code.

STRUCTURE is that which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner.

SURGICAL AREA is the preoperating, operating, recovery and similar rooms within an outpatient health-care center where the patients are incapable of unassisted self-preservation.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0220, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0300 Chapter 3—Use or occupancy.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0300, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0302 Section 302—Mixed use or occupancy.

302.1 General. When a building is used for more than one occupancy purpose, each part of the building comprising a distinct "occupancy", as described in Section 301 shall be separated from any other occupancy as specified in Section 302.4.

EXCEPTIONS:
1. When an approved spray booth constructed in accordance with the Fire Code is installed, such booth need not be separated from Group B, F, H, M or S Occupancies.
2. The following occupancies need not be separated from the uses to which they are accessory:
2.1 Assembly rooms having a floor area of not over 750 square feet (69 m^2).
2.2 Administrative and clerical offices and similar rooms which do not exceed 25 percent of the floor area of the major use when not related to Group H, Division 2 and Group H, Division 3 Occupancies.
2.3 Gift shops, administrative offices and similar rooms in Group R, Division 1 Occupancies not exceeding 10 percent of the floor area of the major use.
2.4 The kitchen serving the dining area of which it is a part.
2.5 Customer waiting rooms not exceeding 450 square feet (41.8 m^2) when not related to Group H Occupancies and when such waiting rooms have an exit directly to the exterior.
2.6 Offices, mercantile, food preparation establishments for off-site consumption, personal care salons or similar uses in Group R dwelling units which are conducted primarily by the occupants of a dwelling unit, which are secondary to the use of the unit for dwelling purposes, and which do not exceed 500 square feet (46.4 m^2).
3. An occupancy separation need not be provided between a Group R, Division 3 Occupancy and a carport having no enclosed uses above, provided the carport is entirely open on two or more sides.
4. A Group S, Division 3 Occupancy used exclusively for the parking or storage of private or pleasure-type motor vehicles need not be separated from a Group S, Division 4 Occupancy open parking garage as defined in Section 311.1.

When a building houses more than one occupancy, each portion of the building shall conform to the requirements for the occupancy housed therein.

An occupancy shall not be located above the story or height set forth in Table 5-B, except as provided in Section 506. When a mixed occupancy building contains a Group H, Division 6 Occupancy, the portion containing the Group H, Division 6 Occupancy shall not exceed three stories or 55 feet (16 764 mm) in height.

302.2 Forms of Occupancy Separations. Occupancy separations shall be vertical or horizontal or both or, when necessary, of such other form as may be required to afford a complete separation between the various occupancy divisions in the building.

Where the occupancy separation is horizontal, structural members supporting the separation shall be protected by equivalent fire-resistive construction.

302.3 Types of Occupancy Separations. Occupancy separations shall be classed as "four-hour fire-resistive", "three-hour fire-resistive", "two-hour fire-resistive", and "one-hour fire-resistive".

1. A four-hour fire-resistive occupancy separation shall have no openings therein and shall not be of less than four-hour fire-resistive construction.

2. A three-hour fire-resistive occupancy separation shall not be of less than three-hour fire-resistive construction. All openings in walls forming such separation shall be protected by a fire assembly having a three-hour fire-protection rating. The total width of all openings in any three-hour fire-resistive occupancy separation wall in any one story shall not exceed 25 percent of the length of the wall in that story and no single opening shall have an area greater than 120 square feet (11 m^2).

All openings in floors forming a three-hour fire-resistive occupancy separation shall be protected by vertical shaft, stairway, ramp or escalator enclosures extending above and below such openings. The wall of such vertical enclosures shall be of not less than two-hour fire-resistive construction and all openings therein shall be protected by a fire assembly having a one- and one-half-hour fire-protection rating.

EXCEPTION: When the walls of such vertical enclosure extending below the three-hour fire-resistive occupancy separation to the foundation are provided with a fire-resistive rating of not less than three hours with openings therein protected as required for walls forming three-hour occupancy separations, the enclosure walls extending above such floor used as the three-hour fire-resistive occupancy separation may have a one-hour fire resistive rating provided:
1. The occupancy above is not required to be of Type I or Type II fire-resistive construction, and
2. The enclosure walls do not enclose an exit stairway, a ramp or an escalator required to have enclosure walls of not less than two-hour fire-resistive construction.

3. A two-hour fire-resistive occupancy separation shall not be of less than two-hour fire-resistive construction. All openings in such separation shall be protected by a fire assembly having a one- and one-half-hour fire-protection rating.

4. A one-hour fire-resistive occupancy separation shall not be of less than one-hour fire-resistive construction. All openings in such separation shall be protected by a fire assembly having a one-hour fire-protection rating.

302.4 Fire Ratings for Occupancy Separations. Occupancy separations shall be provided between the various groups and divisions of occupancies as set forth in Table 3-B. For required separation of specific uses in Group I, Division 1 hospitals and nursing homes, see Table 3-C. See also Section 504.6.1.

EXCEPTIONS: 1. A three-hour occupancy separation may be used between a Group A, Division 1 and a Group S, Division 3 Occupancy used exclusively for the parking or storage of private or pleasure-type motor vehicles provided no repair or fueling is done. A two-hour occupancy separation may be used between a Group A, Division 2, 2.1, 3 or 4 or E or I Occupancy and a Group S, Division 3 Occupancy used exclusively for the parking or storage of private or pleasure-type motor vehicles provided no repair or fueling is done.
2. Unless required by Section 311.2.2, the three-hour occupancy separation between a Group R, Division 1 Occupancy and a Group S, Division 3 Occupancy used only for the parking or storage of private or pleasure-type motor vehicles with no repair or fueling may be reduced to two hours. Such occupancy separation may be further reduced to one hour where the area of such Group S, Division 3 Occupancy does not exceed 3,000 square feet (279 m^2).
3. In the one-hour occupancy separation between Group R, Division 3 and Group U Occupancies, the separation may be limited to the installation of materials approved for one-hour fire-resistive construction on the garage side and a self-closing, tight-fitting solid-wood door 1 3/8 inches (35 mm) in thickness, or a self-closing, tight-fitting door having a fire-protection rating of not less than 20 minutes when tested in accordance with Part II of U.B.C. Standard 7-2, which is a part of this code, is permitted in lieu of a one-hour fire assembly. Fire dampers need not be installed in air ducts passing through the wall, floor or ceiling separating a Group R, Division 3 Occupancy from a Group U Occupancy, provided such ducts within the Group U Occupancy are constructed of steel having a thickness not less than 0.019 inch (0.48 mm) (No. 26 galvanized sheet gage) and have no openings into the Group U Occupancy.
4. Group H, Division 2 and Group H, Division 3 Occupancies need not be separated from Group H, Division 7 Occupancies when such occupancies also comply with the requirements for a Group H, Division 7 Occupancy.

302.5 Heating Equipment Room Occupancy Separation. In Groups A; B; E; F; I; M; R, Division 1; and S Occupancies, rooms containing a boiler, central heating plant or hot-water supply boiler shall be separated from the rest of the building by not less than a one-hour occupancy separation.

EXCEPTIONS: 1. In Groups A, B, E, F, I, M, and S Occupancies, boilers, central heating plants or hot-water supply boilers where the largest piece of fuel equipment does not exceed 400,000 Btu per hour (117.2 kW) input.
2. In Group R, Division 1 Occupancies, a separation need not be provided for such rooms with equipment serving only one dwelling unit.

In Group E Occupancy, when the opening for a heater or equipment room is protected by a pair of fire doors, the inactive leaf shall be normally secured in the closed position and shall be openable only by the use of a tool. An astragal shall be provided and the active leaf shall be self-closing.

In Group H Occupancies, rooms containing a boiler, central heating plant or hot-water supply boiler shall be separated from the rest of the building by not less than a two-hour occupancy separation. In Divisions 1 and 2, there shall be no openings in such occupancy separation except for necessary ducts and piping.

For opening in exterior walls of equipment rooms in Groups A, E or I Occupancies, see Section 303.8.

302.6 Water Closet Room Separation. A room in which a water closet is located shall be separated from food preparation or storage rooms by a tight-fitting door.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0302, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0304 Section 304—Requirements for Group B Occupancies.

304.1 Group B Occupancies Defined.

Group B Occupancies shall include buildings, structures, or portions thereof, for office, professional or service-type transactions, which are not classified as Group H Occupancies. Such occupancies include occupancies for the storage of records and accounts, and eating and drinking establishments with an occupant load of less than 50. Business

occupancies shall include, but not be limited to, the following:

1. Animal hospitals, kennels, pounds.
2. Automobile and other motor vehicle showrooms.
3. Banks.
4. Barber shops.
5. Beauty shop.
6. Car washes.
7. Civic administration.
8. Outpatient clinic and medical offices (where five or less patients in a tenant space are incapable of unassisted self-preservation).
9. Dry cleaning pick-up and delivery stations and self-service.
10. Educational occupancies above the 12th grade.
11. Electronic data processing.
12. Fire stations.
13. Florists and nurseries.
14. Laboratories - testing and research.
15. Laundry pick-up and delivery stations and self-service.
16. Police stations.
17. Post offices.
18. Print shops.
19. Professional services such as attorney, dentist, physician, engineer.
20. Radio and television stations.
21. Telephone exchanges.

For occupancy separations, see Table 3-B.

304.2 Construction, Height and Allowable Area.

304.2.1 General. Buildings or parts of buildings classed as Group B Occupancies because of the use or character of the occupancy shall be limited to the types of construction set forth in Table 5-B. Such occupancies shall not exceed, in area or height, the limits specified in Sections 504, 505 and 506 and shall comply with the provisions of this section.

304.2.2 Special provisions.

304.2.2.1 Laboratories and vocational shops. Laboratories or groups of laboratories under the same management and vocational shops in buildings used for educational purposes, and similar areas containing hazardous materials, shall be separated from each other and other portions of the building by not less than a one-hour fire-resistive occupancy separation. Laboratories or groups of laboratories may include accessory support areas such as offices. When the quantities of hazardous materials in such uses do not exceed those listed in Table 3-D or 3-E, the requirements of Sections 306.5 and 306.8 shall apply. When the quantities of hazardous materials in such uses exceed those allowed by Table 3-D or 3-E, the use shall be classified as the appropriate Group H Occupancy.

Laboratories having an occupant load of 10 or more shall have at least two exits from the room and all portions of the room shall be within 75 feet (22 860 mm) of an exit.

304.2.2.2 Amusement buildings. Amusement buildings with an occupant load of less than 50 shall comply with Section 408.

304.3 Location on Property. For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 503 and Chapter 6.

304.4 Access and Exit Facilities. Exits shall be provided as specified in Chapter 10. See also Section 304.2.2.1 for exits from laboratories.

Access to, and egress from, buildings required to be accessible shall be provided as specified in Chapter 11.

304.5 Light, Ventilation and Sanitation. Light, ventilation and sanitation shall be in accordance with Chapters 12 and 29 and this section.

304.5.1 Ventilation of flammable vapors. See Section 1202.2.2 for ventilation of flammable vapors.

304.5.2 Sanitation. The number of plumbing fixtures shall not be less than specified in Section 2902.3.

304.6 Shaft and Exit Enclosures. Exits shall be enclosed as specified in Chapter 10.

Elevator shafts, vent shafts and other openings through floors shall be enclosed, and the enclosure shall be as specified in Section 711.

In buildings housing Group B Occupancies equipped with automatic sprinkler systems throughout, enclosures need not be provided for escalators where the top of the escalator opening at each story is provided with a draft curtain and automatic fire sprinklers are installed around the perimeter of the opening within 2 feet (610 mm) of the draft curtain. The draft curtain shall enclose the perimeter of the unenclosed opening and extend from the ceiling downward at least 12 inches (305 mm) on all sides. The spacing between sprinklers shall not exceed 6 feet (1829 mm).

304.7 Sprinkler and Standpipe Systems. When required be Section 904.2.1 or other provisions of this code, automatic sprinkler systems and stand pipes shall be installed as specified in Chapter 9.

304.8 Special Hazards. Chimneys and heating apparatus shall conform to the requirements of Chapter 31 of this code and the Mechanical Code.

Storage and use of flammable and combustible liquids shall be in accordance with the Fire Code.

Devices generating a glow, spark or flame capable of igniting flammable vapors shall be installed such that sources of ignition are at least 18 inches (457 mm) above the floor of any room in which Class I flammable liquids or flammable gases are used or stored.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0304, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0305 Section 305—Requirements for Group E Occupancies.

305.1 Group E Occupancies Defined. Group E Occupancies shall be:

Division 1. Any building used for educational purposes through the 12th grade by 50 or more persons for more than 12 hours per week or four hours in any one day.

Division 2. Any building used for educational purposes through the 12th grade by less than 50 persons for more than 12 hours per week or four hours in any one day.

Division 3. Any building or portion thereof used for day care purposes for more than six persons.

EXCEPTION: Family child day care homes shall be considered Group R, Division 3 Occupancies.

For occupancy separations, see Table 3-B.

305.2 Construction, Height and Allowable Area.

305.2.1 General. Buildings or parts of buildings classed in Group E because of the use or character of the occupancy shall be limited to the types of construction set forth in Table 5-B and shall not exceed, in area or height, the limits specified in Sections 504, 505 and 506, except that the area may be increased by 50 percent when the maximum travel distance specified in Section 1003.4 is reduced by 50 percent.

305.2.2 Atmospheric separation requirements.

305.2.2.1 Definitions. For the purpose of this chapter and Section 1017, the following definitions are applicable:

COMMON ATMOSPHERE. A common atmosphere exists between rooms, spaces or areas within a building which are not separated by an approved smoke- and draft-stop barrier.

SEPARATE ATMOSPHERE. A separate atmosphere exists between rooms, spaces or areas that are separated by an approved smoke barrier.

SMOKE BARRIER. A smoke barrier consists of walls, partitions, floors and openings therein as will prevent the transmission of smoke or gases through the construction. See Section 905.

305.2.2.2 General provisions. The provisions of this section apply when a separate exit system is required in accordance with Section 1017.

Walls, partitions and floors forming all or part of an atmospheric separation shall be as required by Section 905.2.3. Glass lights of approved wired glass set in steel frames may be installed in such walls or partitions.

All automatic-closing fire assemblies installed in the atmospheric separation shall be activated by approved smoke detectors.

The specific requirements of this section are not intended to prevent the design or use of other systems, equipment or techniques which will effectively prevent the products of combustion from breaching the atmospheric separation.

305.2.3 Special provisions. Rooms in Division 1 and 2 Occupancies used for kindergarten, first- or second-grade pupils, and Division 3 Occupancies shall not be located above or below the first story.

EXCEPTIONS:
1. Basements or stories having floor levels located within 4 feet (1219 mm), measured vertically, from adjacent ground level at the point of exit, provided the basement or story has exits directly to the exterior at that level.
2. In buildings equipped with an automatic sprinkler system throughout, rooms used for kindergarten, first- and second-grade children or for day care purposes may be located on the second story, provided there are at least two exits directly into separate exiting systems as defined in Section 1017.
3. Division 3 Occupancies may be located above the first story in buildings of Type I construction and in Types II-F.R., II One-hour and III One-hour construction, subject to the limitation of Section 506 when:
3.1 Division 3 Occupancies containing more than 12 children per story shall not be located above the fourth floor; and
3.2 The entire story in which the day care facility is located is equipped with an approved manual fire alarm and smoke-detection system. (See the Fire Code.) Actuation of an initiating device shall sound an audible alarm throughout the entire story. When a building fire alarm system is required by other provisions of this code or the Fire Code, the alarm system shall be connected to the building alarm system.
An approved alarm signal shall sound at an approved location in the day care occupancy to indicate a fire alarm or sprinkler flow condition in other portions of the building; and
3.3 The day care facility, if more than 1000 square feet (92.9 m^2) in area, is divided into at least two compartments of approximately the same size by a smoke barrier with door openings protected by smoke- and draft-control assemblies having a fire-protection rating of not less than 20 minutes. Smoke barriers shall have a fire-resistive rating of not less than one hour. In addition to the requirements of Section 302, occupancy separations between Division 3 Occupancies and other occupancies shall be constructed as smoke barriers. Door openings in the smoke barrier shall be tight-fitting with gaskets installed as required by Section 1005, and shall be automatic closing by actuation of the automatic sprinklers, fire alarm or smoke-detection system. Openings for ducts and other heating, ventilating and air-conditioning openings shall be equipped with a minimum Class I, 250°F. (1210°C.) smoke damper as defined and tested in accordance with approved recognized standards. See Chapter 35, Part III. The damper shall close upon detection of smoke by an approved smoke detector located within the duct, or upon the activation of the fire alarm system; and
3.4 Each compartment formed by the smoke barrier has not less than two exits, one of which is permitted to pass through the adjoining compartment; and
3.5 At least one exit from the Division 3 Occupancy shall be into a separate exiting system as defined in Section 1017; and
3.6 The building is equipped with an automatic sprinkler system throughout.

Stages and platforms shall be constructed in accordance with Chapter 4. For attic space partitions and draft stops, see Section 708.

305.2.4 Special hazards. Laboratories, vocational shops and similar areas containing hazardous materials shall be separated from each other and from other portions of the building by not less than a one-hour fire-resistive occupancy separation. When the quantities or hazardous materials in such uses do not exceed those listed in Table 3-D or 3-E, the

requirements of Section 307.5.2 and 307.8 shall apply. When the quantities of hazardous materials is such uses exceed those listed in Table 3-D or 3-E, the use shall be classified as the appropriate Group H Occupancies.

See Section 1017.7 for exiting from laboratories in Group E Occupancies.

Equipment in rooms or groups of rooms sharing a common atmosphere where flammable liquids, combustible dust or hazards material are used, stored, developed or handled shall conform to the requirements of the Fire Code.

305.3 Location on Property. All buildings housing Group E Occupancies shall front directly on or have access to a public street not less than 20 feet (6096 mm) in width. The access to the public street shall be a minimum 20-foot-wide (6096 mm) right-of-way, unobstructed and maintained only as access to the public street. At least one required exit shall be located on the public street or on the access way.

For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 503 and Chapter 6.

305.4 Access and Exit Facilities. Exits shall be provided as specified in Chapter 10. (For special provisions see Section 1017. See Section 305.2.4 for exit from laboratories.)

Access to, and egress from, buildings required to be accessible shall be provided as specified in Chapter 11.

305.5 Light, Ventilation and Sanitation. All portions of Group E Occupancies customarily occupied by human beings shall be provided with light and ventilation, either natural or artificial, as specified in Chapter 12. See Section 1012 for required exit illumination.

The number of urinals and drinking fountains shall be as specified in Section 2902.4.

305.6 Shaft and Exit Enclosures. Exits shall be enclosed as specified in Chapter 10. Elevator shafts, vent shafts and other vertical openings shall be enclosed, and the enclosure shall be as specified in Section 711.

305.7 Sprinkler and Standpipe Systems. When required by Section 904.2.1 or other provisions of this code, automatic sprinkler systems and standpipes shall be designed and installed as specified in Chapter 9.

305.8 Special Hazards. Chimneys and heating apparatus shall conform to the requirements of Chapter 31 of this code and the Mechanical Code.

Motion picture machine rooms shall conform to the requirements of Chapter 4.

All exterior openings in a boiler room or rooms containing central heating equipment, if located below openings in another story or if less than 10 feet (3048 mm) from other doors or windows of the same building, shall be protected by a fire assembly having a three-fourths-hour fire-protection rating. Such fire assemblies shall be fixed, automatic closing or self-closing.

Class I, II or III-A liquids shall not be placed, stored or used in Group E Occupancies, except in approved quantities as necessary in laboratories and classrooms and for operation and maintenance as set fourth in the Fire Code.

305.9 Fire Alarm Systems. An approved fire alarm system shall be provided for Group E Occupancies with an occupant load of 50 or more persons. In Group E Occupancies provided with an automatic sprinkler or detection system, the operation of such system shall automatically activate the school fire alarm system, which shall include an alarm mounted on the exterior of the building.

See Chapter 10 for smoke-detection requirements.

For installation requirements, see the Fire Code.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0305, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0307 Section 307—Requirements for Group H Occupancies.

307.1 Group H Occupancies Defined.

307.1.1 General. Group H Occupancies shall include buildings or structures, or portions thereof, that involve the manufacturing, processing, generation or storage of materials that constitute a high fire, explosion or health hazard. For definitions, identification and control of hazardous materials and pesticides, and the display of nonflammable solid and nonflammable and noncombustible liquid hazardous material in Group B, F, M or S Occupancies, see the Fire Code. For the application and use of control areas, see Footnote 1 of Tables 3-D and 3-E. Group H Occupancies shall be:

Division 1. Occupancies with a quantity of material in the building in excess of those listed in Table 3-D which present a high explosion hazard, including, but not limited to:

1. Explosives, blasting agents, fireworks and black powder.

EXCEPTION: Storage and the use of pyrotechnic special effect materials in motion picture, television, theatrical and group entertainment production when under permit as required in the Fire Code. The time period for storage shall not exceed 90 days.

2. Unclassified detonatable organic peroxides.

3. Class 4 oxidizers.

4. Class 4 or Class 3 detonatable unstable (reactive) materials.

Division 2. Occupancies where combustible dust is manufactured, used or generated is such a manner that concentrations and conditions create a fire or explosion potential; occupancies with a quantity of material in the building in excess of those listed in Tables 3-D, which present a moderate explosion hazard or a hazard from accelerated burning, including, but not limited to:

1. Class I organic peroxides.

2. Class 3 nondetonatable unstable (reactive) materials.

3. Pyrophoric gases.

4. Flammable or oxidizing gases.

5. Class I, II or III-A flammable or combustible liquids which are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15-pounds-per-square-inch (103.4 kPa) gage.

EXCEPTION: Aerosols.

6. Class 3 oxidizers.

7. Class 3 water-reactive materials.

Division 3. Occupancies where flammable solids, other than combustible dust, are manufactured, used or generated.

Division 3 Occupancies also include uses in which the quantity of material in the building in excess of those listed in Table 3-D presents a high physical hazard, including, but not limited to:

1. Class II, III or IV organic peroxides.

2. Class 1 or 2 oxidizers.

3. Class I, II or III-A flammable or combustible liquids which are used of stored in normally closed containers or systems and containers or systems pressurized at 15-pounds-per-square-inch (103.4 kPa) gage or less, and aerosols.

4. Class III-B combustible liquids.

5. Pyrophoric liquids or solids.

6. Class 1 or 2 water-reactive materials.

7. Flammable solids in storage.

8. Flammable or oxidizing cryogenic fluids (other than inert).

9. Class 1 unstable (reactive) gas or Class 2 unstable (reactive) materials.

Division 4. Repair garages not classified as Group S, Division 3 Occupancies.

Division 5. Aircraft repair hangars and heliports not classified as Group S, Division 5 Occupancies.

Division 6. Semiconductor fabrication facilities and comparable research and development areas in which hazardous production materials (HPM) are used and the aggregate quantity of materials are in excess of those listed in Table 3-D or 3-E. Such facilities and areas shall be designed and constructed in accordance with Section 411.

Division 7. Occupancies having quantities of materials in excess of those listed in Table 3-E that are health hazards, including:

1. Corrosives.

2. Toxic and highly toxic materials.

3. Irritants.

4. Sensitizers.

5. Other health hazards.

307.1.2 Multiple hazards. When a hazardous material has multiple hazards, all hazards shall be addressed and controlled in accordance with the provisions of this chapter.

307.1.3 Liquid use, dispensing and mixing rooms. Rooms in which Class I, Class II and Class III-A flammable or combustible liquids are used, dispensed or mixed in open containers shall be constructed in accordance with the requirements for a Group H, Division 2 Occupancy and the following:

1. Rooms in excess of 500 square feet (46.5 m²) shall have at least one exterior door approved for fire department access.

2. Rooms shall be separated from other areas by an occupancy separation having a fire-resistive rating of not less than one hour for rooms up to 150 square feet (13.9 m²) in area and not less than two hours where the room is more than 150 square feet (13.9 m²) in area. Separations from other occupancies shall not be less than required by Section 302 and Table 3-B.

3. Shelving, racks and wainscoting in such areas shall be of noncombustible construction or wood not less than 1-inch (25 mm) nominal thickness.

4. Liquid use, dispensing and mixing rooms shall not be located in basements.

307.1.4 Liquid storage rooms. Rooms in which Class I, Class II and Class III-A flammable or combustible liquids are stored in closed containers shall be constructed in accordance with the requirements for a Group H, Division 3 Occupancy and to the following:

1. Rooms in excess of 500 square feet (46.5 m²) shall have at least one exterior door approved for fire department access.

2. Rooms shall be separated from other areas by an occupancy separation having a fire-resistive rating of not less than one hour for rooms up to 150 square feet (13.9 m²) in area and not less than two hours where the room is more than 150 square feet (13.9 m²) in area. Separations from other occupancies shall not be less than required by Section 302 and Table 3-B.

3. Shelving, racks and wainscoting in such areas shall be of noncombustible construction or wood of not less than 1-inch (25 mm) nominal thickness.

4. Rooms used for the storage of Class I flammable liquids shall not be located in a basement.

307.1.5 Flammable or combustible liquid storage warehouses. Liquid storage warehouses in which Class I, Class II and Class III-A flammable or combustible liquids are stored in closed containers shall be constructed in accordance with the requirements for a Group H, Division 3 Occupancy and the following:

1. Liquid storage warehouses shall be separated from all other uses by a four-hour area separation wall.

2. Shelving, racks and wainscoting in such warehouses shall be of noncombustible construction or wood not less than 1-inch (25 mm) nominal thickness.

3. Rooms used for the storage of Class I flammable liquids shall not be located in a basement.

307.1.6 Requirement for report. The building official may require a technical opinion and report to identify and develop methods of protection from the hazards presented by

the hazardous material. The opinion and report shall be prepared by a qualified person, firm or corporation approved by the building official and shall be provided without charge to the enforcing agency.

The opinion and report may be include, but is not limited to, the preparation of a hazardous material management plan (HMMP); chemical analysis; recommendation for methods if isolation, separation, containment or protection of hazardous materials or processes, including appropriate engineering controls to be applied; the extent of changes in the hazardous behavior to be anticipated under conditions of exposure to fire or from hazard control procedures; and the limitations or conditions of use necessary to achieve and maintain control of the hazardous materials or operations. The report shall be entered into the files of the code enforcement agencies. Proprietary and trade secret information shall be protected under the laws of the state or jurisdiction having authority.

EXCEPTION: When an HMMP is required, the applicant may submit the report(s) used for compliance with requirements of 40 CFR "Hazardous Chemical Reporting and Community Right-to-Know Regulations" under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

307.2 Construction, Height and Allowable Area.

307.2.1 General. Buildings or parts of buildings classed in Group H because of the use or character of the occupancy shall be limited to the types of construction set forth in Table 5-B and shall not exceed, in area or height, the limits specified in Sections 504, 505 and 506.

307.2.2 Floors. Except for surfacing, floors in areas containing hazardous materials and in areas where motor vehicles, boats, helicopters or airplanes are stored, repaired or operated shall be of noncombustible, liquid-tight construction.

EXCEPTION: In Group H, Division 4 and 5 Occupancies, floors may be surfaced or waterproofed with asphaltic paving materials in that portion of the facility where no repair work is done.

307.2.3 Spill control. When required by the Fire Code, floors shall be recessed a minimum of 4 inches (102 mm) or shall be provided with a liquid-tight raised sill with a minimum height of 4 inches (102 mm) so as to prevent the flow of liquids to adjoining areas. Except for surfacing, the sill shall be constructed of noncombustible material, and the liquid-tight seal shall be compatible with the material being stored. When liquid-tight sills are provided, they may be omitted at door openings by the installation of an open-grate trench which connects to an approved drainage system.

307.2.4 Drainage. When required by the Fire Code, the room, building or area shall be provided with a drainage system to direct the flow of liquids to an approved location or, the room, building or area shall be designed to provide secondary containment for the hazardous materials and fire-protection water.

Drains from the area shall be sized to carry the sprinkler system design flow rate over the sprinkler system design area. The slope of drains shall not be less than 1 percent. Materials of construction for the drainage system shall be compatible with the stored materials.

Incompatible materials shall be separated from each other in the drain systems. They may be combined when that have been rendered acceptable for discharge by an approved means into the public sewer. Drainage of spillage and fire-protection water directed to a neutralizer or treatment system shall comply with the following:

1. The system shall be designed to handle the maximum worst-case spill from the single largest container plus the volume of fire-protection water from the system over the minimum design area for a period of 20 minutes.

2. Overflow from the neutralizer or treatment system shall be provided to direct liquid leakage and fire-protection water to a safe location away from the building, any material or fire-protection control valve, means of egress, adjoining property, or fire department access roadway.

307.2.5 Containment. When required by the Fire Code, drains shall be directed to a containment system or other location designed as secondary containment for the hazardous material liquids and fire-protection water, or the building, room or area shall be designed to provide secondary containment of hazardous material liquids and fire-protection water through the use of recessed floors or liquid-tight raised sills.

Secondary containment shall be designed to retain the spill from the largest single container plus the design flow rate of the sprinkler system for the area of the room or area in which the storage is located or the sprinkler system design area, whichever is smaller. The containment capacity shall be capable of containing the flow for a period of 20 minutes.

Overflow from the secondary containment system shall be provided to direct liquid leakage and fire-protection water to a safe location away from the building, any material or fire-protection control valve, means of egress, fire access roadway, adjoining property or storm drains.

If the storage area is open to rainfall, the secondary containment shall be designed to accommodate the volume of a 24-hour rainfall as determined by a 25-year storm.

When secondary containment is required, a monitoring method capable of detecting hazardous material leakage from the primary containment into the secondary containment shall be provided. When visual inspection of the primary containment is not practical, other approved means of monitoring may be provided. When secondary containment may be subject to the intrusion of water, a monitoring method for such water shall be provided. Whenever monitoring devices are provided, they shall be connected to distinct visual or audible alarms.

307.2.6 Smoke and heat vents. Smoke and heat venting shall be provided in areas containing hazardous materials as set forth in the Fire Code in addition to the provisions of this code.

307.2.7 Standby power. Standby power shall be provided in Group H, Division 1 and 2 Occupancies and in Group H, Division 3 Occupancies in which Class I or II organic peroxides are stored. The standby power system shall be designed

and installed in accordance with the Electrical Code to automatically supply power to all required electrical equipment when the normal electrical supply system is interrupted.

307.2.8 Emergency power. An emergency power system shall be provided in Group H, Divisions 6 and 7 Occupancies. The emergency power system shall be designed and installed in accordance with the Electrical Code to automatically supply power to all required electrical equipment when the normal electrical supply system in interrupted.

The exhaust system may be designed to operate at not less than one half the normal fan speed on the emergency power system when it is demonstrated that the level of exhaust will maintain a safe atmosphere.

307.2.9 Special provisions for Group H, Division 1 Occupancies. Group H, Division 1 Occupancies shall be in buildings used for no other purpose, without basements, crawl spaces or other under-floor spaces. Roofs shall be of lightweight construction with suitable thermal insulation to prevent sensitive material from reaching its decomposition temperature.

Group H, Division 1 Occupancies containing materials which are in themselves both physical and health hazards in quantities exceeding the exempt amounts in Table 3-E shall comply with requirements for both Group H, Division 1 and Group H, Division 7 Occupancies.

307.2.10 Special provisions for Group H, Divisions 2 and 3 Occupancies. Group H, Divisions 2 and 3 Occupancies containing quantities of hazardous materials in excess of those set forth in Table 3-G shall be in buildings used for no other purpose, shall not exceed one story in height and shall be without basements, crawl spaces or other under-floor spaces.

Group H, Divisions 2 and 3 Occupancies containing water-reactive materials shall be resistant to water penetration. Piping for conveying liquids shall not be over or through areas containing water reactives, unless isolated by approved liquid-tight construction.

EXCEPTION: Fire-protection piping may be installed over reactives without isolation.

307.2.11 Special provisions for Group H, Division 4 Occupancies. A Division 4 Occupancy having a floor area not exceeding 2,500 square feet (232 m²) may have exterior walls of not less than two-hour fire-resistive construction when less than 5 feet (1524 mm) from a property line and of not less than one-hour fire-resistive construction when 5 feet (1524 mm) or more but less than 20 feet (6096 mm) from a property line.

307.2.12 Special provisions for Group H, Division 6 Occupancies. See Section 307.11.

307.3 Location on Property. Group H Occupancies shall be located on property in accordance with Section 503, Table 3-F and other provisions of this chapter. In Group H, Division 2 or 3 Occupancies, not less than 25 percent of the perimeter wall of the occupancy shall be an exterior wall.

EXCEPTIONS: 1. Liquid use, dispensing and mixing rooms having a floor area of not more than 500 square feet (46.5 m²) need not be located on the outer perimeter of the building when they are in accordance with Section 307.1.3.
2. Liquid storage rooms having a floor area of not more than 1,000 square feet (93 m²) need not be located on the outer perimeter when they are in accordance with Section 307.1.4.
3. Spray paint booths which comply with the Fire Code need not be located on the outer perimeter.

307.4 Access and Exit Facilities. Exits shall be provided as specified in Chapter 10. (For special provisions see Section 1018.)

Access to, and egress from, buildings required to be accessible shall be provided as specified in Chapter 11.

307.5 Light, Ventilation and Sanitation.

307.5.1 General. Light, ventilation and sanitation in Group H Occupancies shall comply with requirements in this section and Chapters 12 and 29.

307.5.2 Ventilation in hazardous locations. See Section 1202.2.3 for ventilation requirements in hazardous locations.

307.5.3 Ventilation in Group H, Division 4 Occupancies. See Section 1202.2.4 for ventilation requirements in Group H, Division 4 Occupancies.

307.5.4 Sanitation. The number of plumbing fixtures shall not be less than specified in Section 2902.5.

307.6 Shaft and Exit Enclosures. Exits shall be enclosed as specified in Chapter 10.

Elevator shafts, vent shafts and other openings through floors shall be enclosed, and the enclosure shall be as specified in Section 711.

Doors which are a part of an automobile ramp enclosure shall be equipped with automatic-closing devices.

For Group H, Division 6 Occupancies, see Section 307.11.2.3.

307.7 Sprinkler and Standpipe Systems. When required by Section 904.2.1 or other provisions of this code, automatic fire-extinguishing systems and standpipes shall be designed and installed as specified in Chapter 9.

307.8 Special Hazards. Chimneys and heating apparatus shall conform to the requirements of Chapter 31 of this code and the Mechanical Code.

In Divisions 4 and 5 Occupancies, devices which generate a glow, spark or flame capable of igniting flammable vapors shall be installed with sources of ignition at least 18 inches (457 mm) above the floor. See the Mechanical Code for additional restrictions.

Equipment or machinery which generates or emits combustible or explosive dust or fibers shall be provided with an adequate dust-collecting and exhaust system installed in conformance with the Mechanical Code. Equipment or systems that are used to collect, process or convey combustible dusts or fibers shall be provided with an approved explosion venting or containment system.

Combustible fiber storage rooms with a fiber storage capacity not exceeding 500 cubic feet (14.2 m³) shall be separated from the remainder of the building by a one-hour fire-resistive occupancy separation. Combustible fiber

storage vaults having a fiber storage capacity of more than 500 cubic feet (14.2 m^3) shall be separated from the remainder of the building by a two-hour fire-resistive occupancy separation.

Cellulose nitrate film storage and handling shall be in accordance with Section 307.11.

307.9 Fire Alarm Systems. An approved manual fire alarm system shall be provided in Group H Occupancies used for the manufacturing of organic coatings. Approved automatic smoke detection shall be provided for rooms used for the storage, dispensing, use and handling of hazardous materials when required by the Fire Code.

For Group H, Division 6 Occupancies, see Section 307.11.

For installation requirements, see the Fire Code.

For aerosol storage warehouses, see the Fire Code.

307.10 Explosion Control. Explosion control, equivalent protective devices or suppression systems; or barricades shall be provided to control or vent the gases resulting from deflagrations of dusts, gases or mists in rooms, buildings or other enclosures as required by the Fire Code so as to minimize structural or mechanical damage. If detonation rather than deflagration is considered likely, protective devices or systems such as fully contained barricades shall be provided, except that explosion venting to minimize damage from less than 2.0 grams of trinitrotoluene (TNT) (equivalence) is permitted. Walls, floors and roofs separating a use from an explosion exposure shall be designed to resist a minimum internal pressure of 100 pounds per square foot (4.79 kPa) in addition to the loads required by Chapter 16.

Explosion venting shall be provided in exterior walls or roof only. The venting shall be designed to prevent serious structural damage and production of lethal projectiles. The aggregate clear vent relief area shall be regulated by the pressure resistance of the nonrelieving portions of the building and be designed by persons competent in such design. The design shall recognize the nature of the material and its behavior in an explosion. Vents shall consist of any one or any combination of the following to relieve at a maximum internal pressure of 20 pounds per square foot (958 Pa), but not less than the loads required by Chapter 16:

1. Walls of lightweight material.

2. Lightly fastened hatch covers.

3. Lightly fastened, outward-opening swinging doors in exterior walls.

4. Lightly fastened walls or roof.

Venting devices shall discharge vertically or directly to an unoccupied yard not less than 50 feet (15 240 mm) in width on the same lot. Releasing devices shall be so located that the discharge end shall not be less than 10 feet (3048 mm) vertically and 20 feet (6096 mm) horizontally from window openings or exits in the same or adjoining buildings or structures. The exhaust shall always be in the direction of least exposure and never into the interior of the building unless a suitably designed shaft is provided which discharges to the exterior. See Footnote 12 of Table 3-D.

307.11 Group H, Division 6 Occupancies.

307.11.1 General. In addition to the requirements set forth elsewhere in this code, Group H, Division 6 Occupancies shall comply with the provisions of this section and the Fire Code.

307.11.2 Fabrication area.

307.11.2.1 Separation. Fabrication areas, whose sizes are limited by the quantity of hazardous production materials (HPM) permitted by the Fire Code, shall be separated from each other, from exit corridors, and from other parts of the building by not less than one-hour fire-resistive occupancy separations.

EXCEPTIONS: 1. Doors within such occupancy separation, including doors to corridors, shall be only self-closing fire assemblies having a fire-protection rating of not less than three-fourths hours.
2. Windows between fabrication areas and exit corridors may be in accordance with Section 1005.8.2.

307.11.2.2 Floors. Except for surfacing, floors within fabrication areas shall be of noncombustible construction. Openings through floors of fabrication areas may be unprotected when the interconnected levels are used solely for mechanical equipment directly related to such fabrication area. See also Section 307.11.2.3. When forming a part of an occupancy separation, floors shall be liquid tight.

307.11.2.3 Shaft and exit enclosures. Exits shall be enclosed as specified in Chapter 10.

Elevator shafts, vent shafts and other openings through floors shall be enclosed and the enclosure shall be as specified in Section 711. A fabrication area may have mechanical, duct and piping penetrations which extend through not more than two floors within that fabrication area. The annular space around penetrations for cables, cable trays, tubing, piping, conduit or ducts shall be sealed at the floor level to restrict the movement of air. The fabrication area, including the areas through which the ductwork and piping extend, shall be considered a single conditioned environment.

307.11.2.4 Ventilation. See Section 1202.2.5 for ventilation requirements.

307.11.2.5 Transporting hazardous production materials. Hazardous production materials shall be transported to fabrication areas through enclosed piping or tubing systems that comply with Section 307.11.6, through service corridors or in exit corridors as permitted in the exception to Section 307.11.3. The handling or transporting of hazardous production materials within service corridors shall comply with the Fire Code.

307.11.2.6 Electrical. Electrical equipment and devices within the fabrication area shall comply with the Electrical Code. The requirements for hazardous locations need not be applied when the average air change is at least four times that set forth in Section 307.11.2.4 and when the number of air changes at any location is not less than three times that required by Section 307.11.2.4 and the Fire Code.

307.11.3 Exit corridors. Exit corridors shall comply with Section 1005 and shall be separated from fabrication areas as specified in Section 307.11.2.1. Exit corridors shall not be used for transporting hazardous production materials except as provided in Section 307.11.6.2.

EXCEPTION: In existing Group H, Division 6 Occupancies when there are alterations or modifications to existing fabrication areas, the building official may permit the transportation of hazardous production materials in exit corridors subject to the requirements of the Fire Code and as follows:
1. Corridors adjacent to the fabrication area where the alteration work is to be done shall comply with Section 1005 for a length determined as follows:
1.1 The length of the common wall of the corridor and the fabrication area, and
1.2 For the distance along the exit corridor to the point of entry of HPM into the exit corridor serving that fabrication area.
2. There shall be an emergency telephone system or a local alarm manual pull station or approved signal device within exit corridors at not more than 150-foot (45 720 mm) intervals or fraction thereof and at each exit stair doorway. The signal shall be relayed to the emergency control station and a local signaling device shall be provided.
3. Sprinkler protection shall be designed in accordance with U.B.C. Standard 9-1 for Ordinary Hazard Group 3, except that when one row of sprinklers is used in the corridor protection, the maximum number of sprinklers that need be calculated is 13. U.B.C. Standard 9-1 is a part of this code. (See Chapter 35, Part II.)

307.11.4 Service corridors. Service corridors shall be classified as Group H, Division 6 Occupancies. Service corridors shall be separated from exit corridors as required by Section 307.11.2.1.

Service corridors shall be mechanically ventilated as required by Section 307.11.2.4 or at not less than six air changes per hour, whichever is greater.

The maximum distance of travel from any point in a service corridor to an exterior exit door, horizontal exit, exit passageway, enclosed stairway or door into a fabrication area shall not exceed 75 feet (22 860 mm). Dead ends shall not exceed 4 feet (1219 mm) in length. There shall be not less than two exits, and not more than one half of the required exits shall be into the fabrication area. Doors from service corridors shall swing in the direction of exit travel and shall be self-closing.

307.11.5 Storage of hazardous production materials.

307.11.5.1 Construction. The storage of hazardous production materials in quantities greater than those listed in Table 3-D or 3-E shall be in inside rooms complying with Section 307.1.4 or shall be in HPM storage rooms not exceeding 6,000 square feet (557.4 m²) in area. Such HPM storage rooms shall be separated from all other areas by not less than a two-hour fire-resistive occupancy separation when the area is 300 square feet (27.9 m²) or more and not less than one-hour fire-resistive construction when the area is less than 300 square feet (27.9 m²). The provisions of Section 302.1 shall apply.

When an HPM storage room is also used for dispensing of Class I or II flammable liquids or flammable gases, the area of the room shall not exceed 1,000 square feet (93 m²). Except for surfacing, floors of storage rooms shall be of noncombustible liquid-tight construction. Raised grating over floors shall be of noncombustible materials. See Section 307.2.3 for sill requirements for liquid storage rooms.

307.11.5.2 Location within building. When HPM storage rooms are provided, they shall have at least one exterior wall and such wall shall be not less than 30 feet (9144 mm) from property lines, including property lines adjacent to public ways. Explosion control shall be provided when required by Section 307.10.

307.11.5.3 Exits. When two exits are required from HPM storage rooms, one shall be directly to the outside of the building. See Section 307.11.2.1, Exception 1.

307.11.5.4 Ventilation. Mechanical exhaust ventilation shall be provided in storage rooms at the rate of not less than 1 cubic foot per minute per square foot (0.044 L/s/m²) of floor area or six air changes per hour, whichever is greater, for all categories of material.

307.11.5.5 Fire and emergency alarm. An approved manual fire alarm system shall be provided.

An approved initiating device connected to a local alarm system shall be provided outside of each interior exit door from HPM storage rooms. Operation of an alarm bar or an alarm-initiating device shall initiate a local alarm and initiate a signal at the emergency control station.

For installation requirements, see the Fire Code.

307.11.5.6 Electrical. Hazardous production materials storage rooms containing flammable liquids or gases shall be classified as Class I, Division 1 hazardous locations. Electrical wiring and equipment within such rooms shall comply with the Electrical Code for such location.

307.11.6 Piping and tubing.

307.11.6.1 General. Hazardous production materials piping and tubing shall comply with this subsection and shall be installed in accordance with nationally recognized standards. Piping and tubing systems shall be metallic unless the material being transported is incompatible with such system. Systems supplying gaseous HPM having a health hazard ranking of 3 or 4 shall be welded throughout, except for connections, valves and fittings, to the systems which are within a ventilated enclosure. Hazardous production materials supply piping or tubing in service corridors shall be exposed to view.

307.11.6.2 Installations in exit corridors and above other occupancies. Hazardous production materials shall not be located within exit corridors or above areas not classified as Group H, Division 6 Occupancies except as permitted by this subsection.

Hazardous production material piping and tubing may be installed within the space defined by the walls of exit corridors and the floor or roof above or in concealed spaces above other occupancies under the following conditions:

1. Automatic sprinklers shall be installed within the space unless the space is less than 6 inches (152 mm) in least dimension.

2. Ventilation at not less than six air changes per hour shall be provided. The space shall not be used to convey air from any other area.

3. When the piping or tubing is used to transport HPM liquids, a receptor shall be installed below such piping or tubing. The receptor shall be designed to collect any discharge or leakage and drain it to an approved location. The one-hour enclosure shall not be used as part of the receptor.

4. All HPM supply piping and tubing and HPM nonmetallic waste lines shall be separated from the exit corridor and from any occupancy other than Group H, Division 6 by construction as required for walls or partitions that have a fire-protection rating of not less than one hour. When gypsum wallboard is used, joints on the piping side of the enclosure need not be taped, provided the joints occur over framing members. Access openings into the enclosure shall be protected by approved fire assemblies.

5. Readily accessible manual or automatic remotely activated fail-safe emergency shutoff valves shall be installed on piping and tubing other than waste lines at the following locations:

5.1 At branch connections into the fabrication area.

5.2 At entries into exit corridors.

Excess flow valves shall be installed as required by the Fire Code.

6. Electrical wiring and equipment located in the piping space shall be approved for Class I, Division 2 hazardous locations.

EXCEPTION: Occasional transverse crossings of the corridors by supply piping which is enclosed within a ferrous pipe or tube for the width of the corridor need not comply with Items 1 through 6.

307.11.6.3 Identification. Piping, tubing and HPM waste lines shall be identified in accordance with nationally recognized standards to indicate the material being transported.

307.12 Heliports. Heliports may be erected on buildings or other locations if they are constructed in accordance with this chapter and Section 311.10.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0307, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0310 Section 310—Requirements for Group R Occupancies.

310.1 Group R Occupancies Defined. Group R Occupancies shall be:

Division 1. Hotels and apartment houses.

Congregate residences (each accommodating more than 10 persons).

Division 2. Not used.

Division 3. Dwellings, family child day care homes and lodging houses.

Congregate residences (each accommodating 10 persons or less).

Foster Family Care Homes licensed by the Washington State Department of Social and Health Services shall be permitted, as an accessory use to a dwelling unit, for six or fewer children including those of the resident family.

For occupancy separations, see Table 3-B.

A complete code for construction of detached one- and two-family dwellings is in Appendix Chapter 3, Division III, of this code. When adopted, as set forth in Section 101.3, it will take precedence over the other requirements set forth in Chapter 35 of this code.

310.2 Construction, Height and Allowable Area.

310.2.1 General. Buildings or parts of buildings classed in Group R because of the use or character of the occupancy shall be limited to the types of construction set forth in Table 5-B and shall not exceed, in area or height, the limits specified in Section 504, 505 and 506.

310.2.2 Special provisions. Walls and floors separating dwelling units in the same building, or guest rooms in Group R, Division 1 hotel occupancies, shall not be of less than one-hour fire-resistive construction.

Group R, Division 1 Occupancies more than two stories in height or having more than 3,000 square feet (279 m^2) of floor area above the first story shall not be of less than one-hour fire-resistive construction throughout except as provided in Section 601.5.2.2.

Storage or laundry rooms that are within Group R, Division 1 Occupancies that are used in common by tenants shall be separated from the rest of the building by not less than one-hour fire-resistive occupancy separation. The separation between individual storage lockers may be nonrated in rooms of 500 square feet (46.4 m^2) or less in area and in sprinklered rooms of any size.

For Group R, Division 1 Occupancies width Group S, Division 3 parking garage in the basement or first story, see Section 311.2.2.

For attic space partitions and draft stops, see Section 708.

310.3 Location on Property. For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 503 and Chapter 6.

310.4 Access and Exit Facilities and Emergency Escapes. Exits shall be provided as specified in Chapter 10. (See also Section 1013 for exit markings.)

Access to, and egress from, buildings required to be accessible shall be provided as specified in Chapter 11.

Basements in dwelling units and every sleeping room below the fourth story shall have at least one operable window or door approved for emergency escape or rescue which shall open directly into a public street, public alley, yard or exit court. The emergency door or window shall be operable from the inside to provide a full, clear opening without the use of separate tools.

EXCEPTION: The window or door may open into an atrium complying with Section 402 provided the window or door opens onto an exit balcony and the dwelling unit or guest room has an exit which does not open into the atrium.

Escape or rescue windows shall have a minimum net clear openable area of 5.7 square feet (0.53 m²). The minimum net clear openable height dimension shall be 24 inches (610 mm). The minimum net clear openable width dimension shall be 20 inches (508 mm). When windows are provided as a means of escape or rescue, they shall have a finished sill height not more than 44 inches (1118 mm) above the floor.

Escape and rescue windows with a finished sill height below the adjacent ground elevation shall have a window well. Window wells at escape or rescue windows shall comply with the following:

1. The clear horizontal dimensions shall allow the window to be fully opened and provide a minimum accessible net clear opening of 9 square feet (0.84 m²), with a minimum dimension of 36 inches (914 mm).

2. Window wells with a vertical depth of more than 44 inches (1118 mm) shall be equipped with an approved permanently affixed ladder or stairs that are accessible with the window in the fully open position. The ladder or stairs shall not encroach into the required dimensions of the window well by more than 6 inches (152 mm).

Bars, grilles, grates or similar devices may be installed on emergency escape or rescue windows, doors or window wells, provided:

1. The devices are equipped with approved release mechanisms which are openable from the inside without the use of a key or special knowledge or effort; and

2. The building is equipped with smoke detectors installed in accordance with Section 310.9.

310.5 Light, Ventilation and Sanitation. Light and ventilation shall be as specified in Chapter 12. The number of plumbing fixtures shall not be less than specified in Section 2902.6.

310.6 Room Dimensions.

310.6.1 Ceiling heights. Habitable space shall have a ceiling height of not less than 7 feet 6 inches (2286 mm) except as otherwise permitted in this section. Kitchens, halls, bathrooms and toilet compartments may have a ceiling height of not less than 7 feet (2134 mm) measured to the lowest projection from the ceiling. Where exposed beam ceiling members are spaced at less than 48 inches (1219 mm) on center, ceiling height shall be measured to the bottom of these members. Where exposed beam ceiling members are spaced at 48 inches (1219 mm) or more on center, ceiling height shall be measured to the bottom of the deck supported by these members, provided that the bottom of the members is not less than 7 feet (2134 mm) above the floor.

If any room in a building has a sloping ceiling, the prescribed ceiling height for the room is required in only one half the area thereof. No portion of the room measuring less than 5 feet (1524 mm) from the finished floor to the finished ceiling shall be included in any computation of the minimum area thereof.

If any room has a furred ceiling, the prescribed ceiling height is required in two thirds the area thereof, but in no case shall the height of the furred ceiling be less than 7 feet (2134 mm).

310.6.2 Floor area. Dwelling units and congregate residences shall have at least one room which shall have not less than 120 square feet (11.2 m²) of floor area. Other habitable rooms except kitchens shall have an area of not less than 70 square feet (6.5 m²). Efficiency dwelling units shall comply with the requirements of Section 310.7.

310.6.3 Width. Habitable rooms other than a kitchen shall not be less than 7 feet (2134 mm) in any dimension.

310.7 Efficiency Dwelling Units. An efficiency dwelling unit shall conform to the requirements of the code except as herein provided:

1. The unit shall have a living room of not less than 220 square feet (20.4 m²) of superficial floor area. An additional 100 square feet (9.3 m²) of superficial floor area shall be provided for each occupant of such unit in excess of two.

2. The unit shall be provided with a separate closet.

3. The unit shall be provided with a kitchen sink, cooking appliance and refrigeration facilities, each having a clear working space of not less than 30 inches (762 mm) in front. Light and ventilation conforming to this code shall be provided.

4. The unit shall be provided with a separate bathroom containing a water closet, lavatory and bathtub or shower.

310.8 Shaft and Exit Enclosures. Exits shall be enclosed as specified in Chapter 10.

Elevator shafts, vent shafts, dumbwaiter shafts, clothes chutes and other vertical openings shall be enclosed and the enclosure shall be as specified in Section 711.

In nonsprinklered Group R, Division 1 Occupancies, corridors serving an occupant load of 10 or more shall be separated from corridors and other areas on adjacent floors by not less than approved fixed wired glass set in steel frames or by 20-minute smoke- and draft-control assemblies which are automatic closing by smoke detection.

310.9 Smoke Detectors and Sprinkler Systems.

310.9.1 Smoke detectors.

310.9.1.1 General. Dwelling units, congregate residences and hotel or lodging house guest rooms that are used for sleeping purposes shall be provided with smoke detectors. Detectors shall be installed in accordance with the approved manufacturer's instructions.

310.9.1.2 Additions, alterations or repairs to Group R Occupancies. When the valuation of an addition, alteration or repair to a Group R Occupancy exceeds $1,000 and a permit is required, or when one or more sleeping rooms are added or created in existing Group R Occupancies, smoke detectors shall be installed in accordance with Sections 310.9.1.3, 310.9.1.4 and 310.9.1.5 of this section.

EXCEPTION: Repairs to the exterior surfaces of a Group R Occupancy are exempt from the requirements of this section.

310.9.1.3 Power source. In new construction, required smoke detectors shall receive their primary power from the

building wiring when such wiring is served from a commercial source and shall be equipped with a battery backup. The detector shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than those required for over-current protection. Smoke detectors may be solely battery operated when installed in existing buildings; or in buildings without commercial power; or in buildings which undergo alterations, repairs or additions regulated by Section 310.9.1.2.

310.9.1.4 Location within dwelling units. In dwelling units, a detector shall be installed in each sleeping room and at a point centrally located in the corridor or area giving access to each separate sleeping area. When the dwelling unit has more than one story and in dwellings with basements, a detector shall be installed on each story and in the basement. In dwelling units where a story or basement is split into two or more levels, the smoke detector shall be installed on the upper lever, except that when the lower level contains a sleeping area, a detector shall be installed on each level. When sleeping rooms are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. In dwelling units where the ceiling height of a room open to the hallway serving the bedrooms exceeds that of the hallway by 24 inches (610 mm) or more, smoke detectors shall be installed in the hallway and in the adjacent room. Detectors shall sound an alarm audible in all sleeping areas of the dwelling unit in which they are located.

310.9.1.5 Location in efficiency dwelling units, congregate residences and hotels. In efficiency dwelling units, hotel suites and in hotel and congregate residence sleeping rooms, detectors shall be located on the ceiling or wall of the main room or each sleeping room. When sleeping rooms within an efficiency dwelling unit or hotel suite are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. When actuated, the detector shall sound an alarm audible within the sleeping area of the dwelling unit or congregate residence, hotel suite, or sleeping room in which it is located.

310.9.1.6 Location within family child day care homes. In family child day care homes operable detectors shall be located in all sleeping and napping areas. When the family child day care home has more than one story, and in family child day care homes with basements, an operable detector shall be installed on each story and in the basement. In family child day care homes where a story or basement is split into two or more levels, the smoke detector shall be installed in the upper level, except that when the lower level contains a sleeping or napping area, an operable detector shall be located on each level. When sleeping rooms are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. In family child day care homes where the ceiling height of a room open to the hallway serving the bedrooms exceeds that of the hallway by 24 inches or more, smoke detectors shall be installed in the hallway and the adjacent room. Detectors shall sound an alarm audible in all areas of the building.

310.9.2 Sprinkler and standpipe systems. When required by Section 904.2.1 or other provisions of this code, automatic sprinkler systems and standpipes shall be designed and installed as specified in Chapter 9.

310.10 Fire Alarm Systems. Group R, Division 1 Occupancies shall be provided with an approved manual and automatic fire alarm system in apartment houses three or more stories in height or containing 16 or more dwelling units, in hotels three or more stories in height or containing 20 or more guest rooms and in congregate residences three or more stories in height or having an occupant load of 20 or more. A fire alarm and communication system shall be provided in Group R, Division 1 Occupancies located in a high-rise building.

EXCEPTIONS:
1. A manual fire alarm system need not be provided in buildings not over two stories in height when all individual dwelling units and contiguous attic and crawl spaces are separated from each other and public or common areas by at least one-hour fire-resistive occupancy separations and each individual dwelling unit or guest room has an exit directly to a public way, exit court or yard.
2. A separate fire alarm system need not be provided in buildings which are protected throughout by an approved supervised fire sprinkler system having a local alarm to notify all occupants.

The local alarm shall provide an alarm signal with a sound pressure level of 15 dBA above the average ambient sound level in every occupied space within the building. The minimum sound pressure level shall be 70 dBA. The maximum sound pressure level for audible alarm-indicating appliances shall not exceed 110 dBA at the minimum hearing distance from the audible appliance.

For the purposes of this section, area separation walls shall not define separate buildings.

310.11 Heating. Dwelling units, guest rooms and congregate residences shall be provided with heating facilities capable of maintaining a room temperature of 70°F. (21°C.) at a point 3 feet (914 mm) above the floor in all habitable rooms.

310.12 Special Hazards. Chimneys and heating apparatus shall conform to the requirements of Chapter 31 and the Mechanical Code.

The storage, use and handling of flammable and combustible liquids in Division 1 Occupancies shall be in accordance with the Fire Code.

In Division 1 Occupancies, doors leading into rooms in which Class I flammable liquids are stored or used shall be protected by a fire assembly having a one-hour fire-protection rating. Such fire assembly shall be self-closing and shall be posted with a sign on each side of the door in 1-inch (25.4 mm) block letters stating: FIRE DOOR—KEEP CLOSED.

310.13 Family Child Day Care Homes. For family child day care homes with more than six children, each floor level used for family child day care purposes shall be served by two remote exits. Outside exit doors shall be operable from the inside without the use of keys or any special knowledge or effort.

Basements located more than four feet below grade level shall not be used for family child day care homes unless one of following conditions exist:

1. Exit stairways from the basement open directly to the exterior of the building without entering the first floor; or

2. One of the two required exits discharges directly to the exterior from the basement level, and a self closing door is installed at the top or bottom of the interior stair leading to the floor above; or

3. One of the two required exits is an operable window or door, approved for emergency escape or rescue, that opens directly to a public street, public alley, yard or exit court is provided; or

4. A residential sprinkler system is provided throughout the entire building in accordance with National Fire Protection Association Standard 13d.

Floors located more than 4 feet above grade level shall not be occupied by children in family day care homes.

EXCEPTIONS: 1. Use of toilet facilities while under supervision of an adult staff person.
2. Family child day care homes may be allowed on the second story if one of the following conditions exists:
2.1 Exit stairways from the second story open directly to the exterior of the building without entering the first floor; or
2.2 One of the two required exits discharges directly to the exterior from the second story level, and a self closing door is installed at the top or bottom of the interior stair leading to the floor below; or
2.3 A residential sprinkler system is provided throughout the entire building in accordance with National Fire Protection Association Standard 13d.

Every sleeping or napping room in a family child day care home shall have at least one operable window for emergency rescue.

EXCEPTION: Sleeping or napping rooms having doors leading to two separate exit ways, or a door leading directly to the exterior of the building.

Rooms or spaces containing a commercial-type cooking kitchen, boiler, maintenance shop, janitor closet, laundry, woodworking shop, flammable or combustible storage, or painting operation shall be separated from the family child day care area by at least one-hour fire-resistive construction.

EXCEPTION: A fire-resistive separation shall not be required where the food preparation kitchen contains only domestic cooking range, and the preparation of food does not result in the production of smoke or grease laden vapors.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0310, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0313 Section 313—Requirements for Group LC Occupancies.

313.1 Group LC Occupancies Defined. Group LC Occupancies shall include buildings, structures, or portions thereof, used for the business of providing licensed care to clients in one of the following categories regulated by either the Washington Department of Health or the Department of Social and Health Services:

1. Adult family home.
2. Adult residential rehabilitation facility.
3. Alcoholism intensive inpatient treatment service.
4. Alcoholism detoxification service.
5. Alcoholism long term treatment service.
6. Alcoholism recovery house service.
7. Boarding home.
8. Group care facility.
9. Group care facility for severely and multiple handicapped children.
10. Residential treatment facility for psychiatrically impaired children and youth.

EXCEPTION: Where the care provided at an alcoholism detoxification service is acute care similar to that provided in a hospital, the facility shall be classified as a Group I, Division 1.1 hospital.

313.2 Construction, Height and Allowable Area.

313.2.1 General. Buildings or parts of buildings classed in Group LC because of the use or character of the occupancy shall be limited to the types of construction set forth in this section.

313.2.1.1 Type of construction. Except as provided herein, LC Occupancy buildings may be of any construction type allowed in this code and shall not exceed the limits specified in Sections 504, 505 and 506.

Group LC Occupancies which are licensed for more than six clients and which are more than two stories in height or which have more than 3,000 square feet (279 m^2) above the first story shall not be less than one-hour fire-resistive construction throughout.

EXCEPTION: Buildings which are licensed for not more than 16 clients may be of Type V-N construction provided:
1. The entire building has an interior wall and ceiling covering consisting of 1/2 inch gypsum wall board or an approved equal installed in accordance with Section 2511; and,
2. An approved smoke-detection system, supervised by an approved central, proprietary or remote station service, is installed throughout the entire structure and is interconnected with any required sprinkler system.

For attic space partitions and draft stops, see Section 708.

313.2.1.2 Area and height. Buildings classified as Group LC Occupancy shall not exceed, in area or height, the limitations set forth in Table 5-B for Group R, Division 1 Occupancies.

EXCEPTION: LC occupancies licensed for six or fewer clients may be of unlimited area provided they are limited to 3 stories or less.

313.2.1.3 Mixed Occupancies. Group LC Occupancies shall be separated from Group H occupancies by a four-hour fire-resistive occupancy separation and shall be separated from all other occupancies by a one-hour fire-resistive assembly.

EXCEPTIONS: 1. An occupancy separation need not be provided between an Group LC Occupancy licensed for 16 or fewer clients and a carport having no enclosed use above, provided the carport is entirely open on two or more sides.
2. In a Group LC Occupancy licensed for 16 or fewer clients, the one-hour occupancy separation between a Group LC Occupancy and a Group U, Division 1 Occu-

pancy, may be limited to the installation of materials approved for one- hour fire-resistive construction on the garage side and a self-closing, tight-fitting solid-wood door 1 3/8 inches (35 mm) in thickness, or a self-closing tight-fitting door having a fire-protection rating of not less than 20 minutes when tested in accordance with Part II of U.B.C. Standard 7-2, which is a part of this code, is permitted in lieu of a one-hour fire assembly. Fire dampers need not be installed in air ducts passing through the wall, floor or ceiling separating a Group LC Occupancy from a Group U Occupancy, provided such ducts within the Group U Occupancy are constructed of steel having a thickness not less than 0.019 inch (0.48 mm) (No. 26 galvanized sheet gage) and having no openings into the Group U Occupancy.

313.3 Location on Property. For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 503 and Chapter 6. For the purpose of this determination, LC Occupancies licensed for six or fewer clients shall comply with provisions for Group R, Division 3 Occupancies; and all other LC occupancies shall comply with provisions for Group R, Division 1 Occupancies.

313.4 Access and Exit Facilities and Emergency Escapes.

313.4.1 Evacuation capability. Evacuation capability is the ability of the clients of a licensed care facility to respond to an emergency situation and either evacuate a building or move to a point of safety. Clients shall be classified in one of the following levels:

I - persons physically and mentally capable of walking or traversing a normal path to safety, including the ascent and descent of stairs, and capable of self-preservation, without the physical assistance of another person.

II - persons physically and mentally capable of traversing a normal path to safety with the use of mobility aids, but unable to ascend or descend stairs without the physical assistance of another person.

III - persons physically or mentally unable to walk or traverse a normal path to safety without the physical assistance of another person.

313.4.2 Exit facilities. Exits shall be provided as specified in Chapter 10. For the purpose of determining exit requirements, Group LC Occupancies shall be considered to have an occupant load factor of 300. At least two exits shall be required when the number of occupants (clients and staff) is 10 or more. For all other requirements of Chapter 10, Group LC Occupancies licensed for six or fewer clients shall comply with provisions for Group R, Division 3 Occupancies; and all other Group LC Occupancies shall comply with provisions for Group R, Division 1 Occupancies.

EXCEPTION: Exit illumination required by Section 1012.1 need not be provided in any Group LC Occupancy licensed for six or fewer clients.

313.4.3 Accessibility. In new construction, Group LC Occupancies regardless of the number of clients shall comply with accessibility standards for Group R, Division 1 congregate residences as specified in Chapter 11.

Where a Group LC Occupancy is being established by change of occupancy in an existing building, the building shall be altered to comply with congregate residence provisions of Chapter 11 if any of the clients is a person with disability. The alterations shall provide the minimum necessary access appropriate for the disabilities of the clients. Any alteration, whether to accommodate a client with disability or for another purpose, shall comply with Part III of Chapter 11.

313.4.4 Emergency escape.

313.4.4.1 Location of sleeping rooms. In every licensed care facility, all sleeping rooms occupied by clients with an evacuation capability of II or III shall be located on a grade level floor which provides not less than two means of egress which do not require clients to use stairs, elevator, or platform lift to exit the facility.

EXCEPTIONS: 1. In a Group LC Occupancy licensed to provide care to two or fewer clients with an evacuation capability of II or III and six or fewer total clients, only one means of egress which does not require clients to use stairs, elevator or platform lift to exit the facility need be provided.
2. Sleeping rooms for clients with an evacuation capability of II or III may be located on floors other than at grade level, provided the facility is divided into at least two compartments by smoke barriers of not less than one-hour fire-resistance meeting the requirements of Sections 308.2.2.1 and 905.2.3.

313.4.4.2 Escape windows and doors. Every sleeping room below the fourth story (including basements) shall have at least one operable window or door approved for emergency escape or rescue which shall open directly into a public street, public alley, yard or exit court. The emergency window shall be operable from the inside to provide a full, clear opening without the use of separate tools.

EXCEPTION: The window or door may open into an atrium complying with Section 402 provided the window or door opens onto an exit balcony and the sleeping room has an exit which does not open into the atrium.

Escape or rescue windows shall have a minimum net clear openable area of 5.7 square feet (0.53 m^2). The minimum net clear openable height dimension shall be 24 inches (610 mm). The minimum net clear openable width dimension shall be 20 inches (508 mm). When windows are provided as a means of escape or rescue, they shall have a finished sill height not more than 44 inches (1118 mm) above the floor.

Escape and rescue windows with a finished sill height below the adjacent ground elevation shall have a window well. Window wells at escape and rescue windows shall comply with the following:

1. The clear horizontal dimension shall allow the window to be fully opened and provide a minimum accessible net clear opening of 9 square feet (0.84 m^2), with a minimum dimension of 36 inches (914 mm).

2. Window wells with a vertical depth of more than 44 inches (1118 mm) shall be equipped with an approved permanently affixed ladder or stairs that are accessible with the window in the fully open position. The ladder or stairs shall not encroach into the required dimensions of the window well by more than 6 inches (152 mm).

Bars, grilles, grates or similar devices may be installed on emergency escape windows, doors or window wells, provided:

1. The devices are equipped with approved release mechanisms which are operable from the inside without the use of a key or special knowledge or effort; and

2. The building is equipped with smoke detectors installed in accordance with Section 313.8.

313.5 Light, Ventilation and Sanitation.

313.5.1 General. For the purpose of determining the light and ventilation for Group LC Occupancies required by this section, any room many be considered as a portion of an adjoining room when one half of the area of the common wall is open and unobstructed and provides an opening of not less than one tenth of the floor area of the interior room or 25 square feet (2.3 m^2), whichever is greater.

Exterior openings for natural light or ventilation required by this section shall open directly onto a public way or a yard or court as set for in Section 313.5.4.

EXCEPTIONS: 1. Required exterior openings may open into a roofed porch where the porch:
1.1 Abuts a public way, yard or court; and
1.2 Has a ceiling height of not less than 7 feet (2134 mm); and
1.3 Has a longer side at least 65 percent open and unobstructed.
2. Skylights.

313.5.2 Light. Sleeping rooms and habitable rooms within the licensed care facility shall be provided with natural light by means of exterior glazed openings with an area not less than one tenth of the floor area of such rooms with a minimum of 10 square feet (0.93 m^2).

EXCEPTION: Kitchens may be provided with artificial light.

313.5.3 Ventilation. Group LC Occupancies shall comply with provisions for Group R Occupancies as provided in the Washington State Ventilation and Indoor Air Quality Code (WAC 51-13).

313.5.4 Yards and Courts.

313.5.4.1 General. This section shall apply to yards and courts adjacent to exterior openings that provide required light or ventilation. Such yards and courts shall be on the same property as the building.

313.5.4.2 Yards. Yards shall not be less than 3 feet (914 mm) in width for one-story and two-story buildings. For buildings more than two stories in height, the minimum width of the yard shall be increased at the rate of 1 foot (305 mm) for each additional story. For buildings exceeding 14 stories in height, the required width of the yard shall be computed on the basis of 14 stories.

313.5.4.3 Courts. Courts shall not be less than 3 feet (914 mm) in width. Courts having windows opening on opposite sides shall not be less than 6 feet (1829 mm) in width. Courts bounded on three or more sides by the walls of the building shall not be less than 10 feet (3048 mm) in length unless bounded on one end by a public way or yard. For buildings more than two stories in height, the court shall be increased 1 foot (305 mm) in width and 2 feet (610 mm) in length for each additional story. For buildings exceeding 14 stories in height, the required dimensions shall be computed on the basis of 14 stories.

Adequate access shall be provided to the bottom of all courts for cleaning purposes. Every court more than two stories in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet (0.93 m^2) in area and leading to the exterior of the building unless abutting a yard or a public way. The construction of the air intake shall be as required for the court walls of the building but in no case less than one-hour fire resistive.

313.5.4.4 Eaves. Eaves over required windows shall extend no closer than 30 inches (762 mm) from the side and rear property lines. See also Sections 503.2 and 705.

313.5.5 Sanitation.

313.5.5.1 General. Sanitation facilities shall comply with Chapter 29 and the provisions of this section. Any room in which a water closet is located shall be separated from food preparation or storage rooms by a self-closing tight-fitting door.

313.5.5.2 Group LC Occupancies with six or fewer clients. Group LC Occupancies licensed for six or fewer clients shall be provided with not less than one water closet, one lavatory and one bathtub or shower.

313.5.5.3 Group LC Occupancies with more than six clients. Group LC Occupancies licensed for more than six clients shall provide not less than one water closet for each 10 male clients, or fractional part thereof, and not less than one water closet for each 8 female clients, or fractional part thereof.

In addition, not less than one lavatory shall be provided for each 12 male clients, or fractional part thereof, and not less than one lavatory for each 12 female clients, or fractional part thereof. Where the number of clients of either sex exceeds 12, one lavatory shall be added for each additional 20 males, or fractional part thereof, and one lavatory shall be added for each additional 15 females, or fractional part thereof.

In addition, not less than one bathtub or shower shall be provided for every eight clients, or fractional part thereof. Where there are female clients, one additional bathtub or shower shall be provided for each 30 female clients, or fractional part thereof. Where the number of total clients exceeds 150, one bathtub or shower shall be provided for each 20 clients, or fractional part thereof, over 150 clients.

313.6 Room Dimensions.

313.6.1 Ceiling Heights. Habitable space shall have a ceiling height of not less than 7 feet 6 inches (2286 mm) except as otherwise permitted in this section. Kitchens, halls, bathrooms and toilet compartments may have a ceiling height of not less than 7 feet (2134 mm) measured to the lowest projection from the ceiling. Where exposed beam ceiling members are spaced at less than 48 inches (1219 mm) on center, ceiling height shall be measured to the bottom of those members. Where exposed beam ceilings members are spaced at 48 inches (1219 mm) or more on center, ceiling height shall be measured to the bottom of the

deck supported by these members, provided that the bottom of the members is not less than 7 feet (2134 mm) above the floor.

If any room in a building has a sloping ceiling, the prescribed ceiling height for the room is required in only one half of the area thereof. No portion of the room measuring less than 5 feet (1524 mm) from the finished floor to the finished ceiling shall be included in any computation of the minimum area thereof.

If any room has a furred ceiling, the prescribed ceiling height is required in two thirds the area thereof, but in no case shall the height of the furred ceiling be less than 7 feet (2134 mm).

313.6.2 Floor area. Group LC Occupancies shall have at least one room which shall have not less than 120 square feet (11.2 m^2) of floor area. Other habitable rooms except kitchens shall have an area of not less than 70 square feet (6.5 m^2).

313.6.3 Width. Habitable rooms other than kitchens shall not be less than 7 feet (2134 mm) in any dimension.

313.7 Shaft and Exit Enclosures. Exits shall be enclosed as specified in Chapter 10.

Elevator shafts, vent shafts, dumbwaiter shafts, clothes chutes and other vertical openings shall be enclosed and the enclosure shall be as specified in Section 711.

313.8 Smoke Detectors and Sprinkler Systems.

313.8.1 Smoke detectors.

313.8.1.1 General. Rooms within licensed care facilities that are used for sleeping purposes shall be provided with smoke detectors. Detectors shall be installed in accordance with the approved manufacturer's instructions.

313.8.1.2 Additions, alterations or repairs. When the valuation of an addition, alteration or repair to a Group LC Occupancy exceeds $1,000 and a permit is required, or when one or more sleeping rooms is added or created in an existing Group LC Occupancy, smoke detectors shall be installed in accordance with Sections 313.8.1.3 and 313.8.1.4 of this section.

EXCEPTION: Repairs to the exterior surfaces are exempt from the requirements of this section.

313.8.1.3 Power source. In new construction, required smoke detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source and shall be equipped with a battery backup. The detector shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke detectors may be solely battery operated when installed in existing buildings; or in buildings without commercial power; or in buildings which undergo alterations, repairs or additions regulated by Section 313.8.1.2.

313.8.1.4 Location. A detector shall be installed in each sleeping room and at a point centrally located in the corridor or area giving access to each separate sleeping area. When the licensed care facility has more than one story or in facilities with basements, a detector shall be installed on each story and in the basement. Where a story or basement is split into two or more levels, the smoke detector shall be installed on the upper level, except that when the lower level contains a sleeping area, a detector shall be installed on each level. When sleeping rooms are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. Where the ceiling height of a room open to the a hallway serving the bedrooms exceeds that of the hallway by 24 inches (610 mm) or more, smoke detectors shall be installed in the hallway and in the adjacent room. Detectors shall sound an alarm audible in all sleeping areas of the licensed care facility in which they are located.

313.8.2 Sprinkler and standpipe systems.

313.8.2.1 Sprinkler systems. An automatic sprinkler system shall be installed throughout every licensed care facility three or more stories in height or licensed for more than 16 clients. Licensed care facilities with 16 or fewer clients, licensed to provide care for more than two clients who have an evacuation capability of II or III, shall be provided with an automatic sprinkler system throughout the facility.

EXCEPTION: An automatic sprinkler system need not be installed in any licensed care facility licensed for six or fewer clients regardless of the level of evacuation capability.

Where a sprinkler system is required, a system complying with U.B.C. Standard 9-1 shall be installed.

EXCEPTIONS: 1. An automatic sprinkler systems complying with U.B.C. Standard 9-3 may be installed in buildings of four stories or less.
2. Where a Group LC Occupancy is being established by change of occupancy in an existing building not protected by a sprinkler system as is required above for buildings of new construction, an automatic sprinkler system complying with N.F.P.A Standard 13d may be installed provided the care facility is licensed for not more than 16 clients.

Residential or quick-response heads shall be used in all sprinkler systems.

313.8.2.2 Standpipe systems. Standpipe systems shall be provided where required by Section 904.5

313.9 Fire Alarm Systems. Group LC Occupancies licensed for more than 16 clients shall be provided with an approved manual and automatic fire alarm system. The local alarm shall provide an alarm signal with a sound pressure level of 15 dBA above the average ambient sound level in every occupied space within the building. The minimum sound pressure level shall be 70 dBA. The maximum sound pressure level shall not exceed 110 dBA at the minimum hearing distance from the audible appliance.

313.10 Heating. Licensed care facilities shall be provided with heating facilities capable of maintaining a room temperature of 70°F. (21°C.) at a point 3 feet (914 mm) above the floor in all habitable rooms.

313.11 Special Hazards. Chimneys and heating apparatus shall conform to the requirements of Chapter 31 and the Mechanical Code.

In Group LC Occupancies licensed for more than six clients, the storage, use and handling of flammable and combustible liquids shall be in accordance with the Fire Code. In such facilities, doors leading into rooms in which

Class I flammable liquids are stored or used shall be protected by a fire assembly having a one-hour fire-protection rating. Such fire assembly shall be self-closing and shall be posted with a sign on each side of the door in 1-inch (25.4 mm) block letters stating: FIRE DOOR—KEEP CLOSED.

In Group LC Occupancies licensed for more than 16 clients, rooms containing a boiler, central heating plant or hot-water supply boiler shall be separated from the rest of the building by not less than a one-hour occupancy separation.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0313, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0400 Chapter 4—Special use and occupancy.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0400, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0403 Section 403—Special provisions for Group B office buildings and Group R, Division 1 Occupancies.

403.1 Scope. This section applies to all Group B office buildings and Group R, Division 1 Occupancies, each having floors used for human occupancy located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access. Such buildings shall be of Type I or II-F.R. construction and shall be provided with an approved automatic sprinkler system in accordance with Section 403.2.

403.2 Automatic Sprinkler System.

403.2.1 System design. The automatic sprinkler system shall be provided throughout the building as specified by U.B.C. Standard 9-1, and shall be designed in accordance with that standard and the following:

1. Shutoff valves and a water-flow device shall be provided for each floor. The sprinkler riser may be combined with the standpipe riser.

2. In Seismic Zones 2, 3 and 4, in addition to the main water supply, a secondary on-site supply of water equal to the hydraulically calculated sprinkler design demand plus 100 gallons per minute (378.5 L/min.) additional for the total standpipe system shall be provided. This supply shall be automatically available if the principal supply fails and shall have a duration of 30 minutes.

403.2.2 Modifications. The following modifications of code requirements are permitted:

1. In buildings of Type I construction the fire-resistive time periods set forth in Table 6-A may be reduced by one hour for interior bearing walls, exterior bearing and nonbearing walls, roofs and the beams supporting roofs, provided they do not frame into columns. In buildings of Type II-F.R. construction the fire-resistive time period set forth in Table 6-A may be reduced by one hour for interior bearing walls, exterior bearing and nonbearing walls, but no reduction is allowed for roofs.

Vertical shafts other than stairway enclosures and elevator shafts may be reduced to one hour when sprinklers are installed within the shafts at alternate floors. The fire-resistive time period reduction as specified herein shall not apply to exterior bearing and nonbearing walls whose fire-resistive rating is less than four hours.

2. Except for corridors in Group B offices and Group R, Division 1 Occupancies and partitions separating dwelling units or guest rooms, all interior nonbearing partitions required to be one-hour fire-resistive construction by Table 6-A may be of noncombustible construction without a fire-resistive time period.

3. Fire dampers, other than those needed to protect floor-ceiling assemblies to maintain the fire resistance of the assembly, are not required.

4. Emergency windows required by Section 310.4 are not required.

403.3 Smoke Detection. Smoke detectors shall be provided in accordance with this subsection. Smoke detectors shall be connected to an automatic fire alarm system installed in accordance with the Fire Code. The actuation of any detector required by this subsection shall operate the emergency voice alarm signaling system and shall place into operation all equipment necessary to prevent the recirculation of smoke.

Smoke detectors shall be located as follows:

1. In every mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar room and in elevator lobbies. Elevator lobby detectors shall be connected to an alarm verification zone or be listed as releasing devices.

2. In the main return-air and exhaust-air plenum of each air-conditioning system. Such detector shall be located in a serviceable area downstream of the last duct inlet.

3. At each connection to a vertical duct or riser serving two or more stories from a return-air duct or plenum of an air-conditioning system. In Group R, Division 1 Occupancies, an approved smoke detector may be used in each return-air riser carrying not more than 5,000 cubic feet per minute (2360 L/s) and serving not more than 10 air inlet openings.

4. For Group R, Division 1 Occupancies in all interior corridors serving as a required exit for a occupant load of 10 or more.

403.4 Smoke Control. A smoke-control system meeting the requirements of Chapter 9 shall be provided.

403.5 Fire Alarm and Communication Systems.

403.5.1 General. The fire alarm, emergency voice/alarm signaling system and fire department communication systems shall be designed and installed as set forth in this code and the Fire Code.

403.5.2 Emergency voice alarm signaling system. The operation of any automatic fire detector, sprinkler or water-flow device shall automatically sound an alert tone followed by voice instructions giving appropriate information and direction on a general or selective basis to the following terminal areas:

1. Elevators.

2. Elevator lobbies.

3. Corridors.

4. Exit stairways.

5. Rooms and tenant spaces exceeding 1,000 square feet (93 m²) in area.

6. Dwelling units in apartment houses.

7. Hotel guest rooms or suites.

A manual override for emergency voice communication shall be provided for all paging zones.

403.5.3 Fire department communication system. A two-way, approved fire department communication system shall be provided for fire department use. It shall operate between the central control station and elevators, elevator lobbies, emergency and standby power rooms and at entries into enclosed stairways.

403.6 Central Control Station.

403.6.1 General. A central control station room for fire department operations shall be provided. The location, size and arrangement of the central control station shall be approved by the authority having jurisdiction. The central control station room shall be separated from the remainder of the building by not less than a one-hour fire-resistive occupancy separation. It shall contain the following as a minimum:

1. The voice alarm and public address system panels.

2. The fire department communications annunciator panel.

3. Fire-detection and alarm systems annunciator panels.

4. Annunciator visually indicating the location of the elevators and whether they are operational.

5. Status indicators and controls for air-handling systems.

6. Controls for unlocking all stairway doors simultaneously.

7. Sprinkler valve and water-flow detector display panels.

8. Emergency and standby power status indicators.

9. A telephone for fire department use with controlled access to the public telephone system.

10. Fire pump status indicators.

11. Schematic building plans indicating the typical floor plan and detailing the building core, exit facilities, fire-protection systems, fire fighting equipment and fire department access.

12. Work table.

403.6.2 Annunciation identification. Control panels in the central control station shall be permanently identified as to function.

Alarm, supervisory and trouble signals as required by Items 3 and 7 above shall be annunciated in compliance with the Fire Code in the central control station by means of an audible and visual indicator. For purposes of annunciation, zoning shall be in accordance with the following:

1. When the system serves more than one building, each building shall be considered separately.

2. Each floor shall be considered a separate zone. When one or more sprinkler risers serve the same floor, each riser shall be considered a separate zone.

EXCEPTION: When more than one riser serves the same system on the floor.

403.7 Elevators. Elevators and elevator lobbies shall comply with the provisions of Chapter 30 and the following:

Note: A bank of elevators is a group of elevators or a single elevator controlled by a common operating system; that is, all those elevators which respond to a single call button constitute a bank of elevators. There is no limit on the number of cars which may be in a bank or group, but there may not be more than four cars within a common hoistway.

1. Elevators on all floors shall open into elevator lobbies which are separated from the remainder of the building, including corridors and other exits, by walls extending from the floor to the underside of the fire-resistive floor or roof above. Such walls shall not be of less than one-hour fire-resistive construction. Openings through such walls shall conform to Section 1005.8.

EXCEPTIONS:
1. The main entrance-level elevator lobby in office buildings.
2. Elevator lobbies located within an atrium complying with the provisions of Section 402.
3. In fully sprinklered office buildings, corridors may lead through enclosed elevator lobbies if all areas of the building have access to at least one required exit without passing through the elevator lobby.

2. Each elevator lobby shall be provided with an approved listed smoke detector located on the lobby ceiling. When the detector is activated, elevator doors shall not open and all cars serving that lobby are to return to the main floor and be under manual control only. If the main floor detector or a transfer floor detector is activated, all cars serving the main floor or transfer floor shall return to a location approved by the fire department and building official and be under manual control only. The detector may serve to close the lobby doors, additional doors at the hoistway opening allowed in Section 3007 and smoke dampers serving the lobby.

3. Elevator hoistways shall not be vented through an elevator machine room. Cable slots entering the machine room shall be sleeved into the machine room. Such sleeves shall be no larger than necessary for free passage of the cables. Each elevator machine room shall be treated as a separate smoke-control zone.

403.8 Standby Power, Light and Emergency Systems.

403.8.1 Standby power. A standby power-generator set conforming to the Electrical Code shall be provided on the premises. The set shall supply all functions required by this section at full power. Set supervisions with manual start and transfer override features shall be provided at the central control station.

An on-premises fuel supply sufficient for not less than two hours' full-demand operation of the system shall be provided.

The standby system shall have a capacity and rating that would supply all equipment required to be operational at the same time. The generating capacity need not be sized to operate all the connected electrical equipment simultaneously.

All power, lighting, signal and communication facilities specified in Sections 403.3, 403.4, 403.5, 403.6, 403.7 and 403.8, as applicable; fire pumps required to maintain pressure, standby lighting and normal circuits supplying exit signs and exit illumination shall be transferable to the standby source.

403.8.2 Standby lighting. Standby lighting shall be provided as follows:

1. Separate lighting circuits and fixtures sufficient to provide light with an intensity of not less than one footcandle measured at floor level in all exit corridors, stairways, pressurized enclosures, elevator cars and lobbies and other areas which are clearly a part of the escape route.

2. All circuits supply lighting for the central control station and mechanical equipment room.

403.8.3 Emergency systems. The following are classified as emergency systems and shall operate within 10 seconds of failure of the normal power supply:

1. Exit sign and exit illumination as required by Sections 1012 and 1013.

2. Elevator car lighting.

403.9 Exits. Exits shall comply with other requirements of this code and the following:

1. All stairway doors which are locked from the stairway side shall have the capability of being unlocked simultaneously without unlatching upon a signal from the central control station.

2. A telephone or other two-way communications system connected to an approved emergency service which operates continuously shall be provided at not less than every fifth floor in each required stairway where other provisions of this code permit the doors to be locked.

403.10 Seismic Considerations. In Seismic Zones 2, 3 and 4, the anchorage of mechanical and electrical equipment required for life-safety systems, including fire pumps and elevator drive and suspension systems, shall be designed in accordance with the requirements of Section 1624.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0403, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0405 Section 405—Stages and platforms.

405.1 Scope.

405.1.1 Standards of quality. Stages, platforms and accessory spaces in assembly occupancies shall conform with the requirements of Section 405.

The standards listed below labeled a "U.B.C. Standard" are also listed in Chapter 35, Part II, and are part of this code.

1. U.B.C. Standard 4-1, Proscenium Curtains

2. U.B.C. Standard 9-1, Installation of Sprinkler Systems

3. U.B.C. Standard 8-1, Test Method for Surface-burning Characteristics of Building Materials

4. U.B.C. Standard 7-1, Fire Tests of Building Construction and Materials

405.1.2 Definitions. For the purpose of this chapter, certain terms are defined as follows:

BATTEN is a flown metal pipe or shape on which lights or scenery are fastened.

DROP is a large piece of scenic canvas or cloth which hangs vertically, usually across the stage area.

FLY is the space over the stage of a theater where scenery and equipment can be hung out of view. Also called lofts and rigging lofts.

FLY GALLERY is a catwalk above a stage from which the movement of scenery and operation of other stage effects are controlled.

GRIDIRON is the structural framing over a stage supporting equipment for hanging or flying scenery and other stage effects. A gridiron grating shall not be considered a floor.

LEG DROP is a long narrow strip of fabric used for masking. When used on either or both sides of the acting area, it is provided to designate an entry onto the stage by the actors. It is also used to mask the side stage area. They may also be called "wings".

PINRAIL is a rail on or above a stage which has belaying pins to which lines are fastened.

PLATFORM is that raised area within a building used for the presentation of music, plays or other entertainment; the head table for special guests; the raised area for lectures and speakers; boxing and wrestling rings; theater in the round; and similar purposes wherein there are not overhead hanging curtains, drops, scenery or stage effects other than lighting.

PLATFORM, PERMANENT is a platform used within an area for more than 30 days.

PLATFORM, TEMPORARY is a platform used within an area for not more than 30 days.

PROSCENIUM WALL is the wall that separates the stage from auditorium or house.

STAGE is a space within a building used for entertainment or presentations, with a stage height of 50 feet (15 240 mm) or less. Curtains, drops, scenery, lighting devices and other stage effects are hug and not retractable except for a single lighting bank; single main curtain, border and legs; and single backdrop.

STAGE AREAS are the entire performance area and adjacent backstage and support areas not separated from the performance area by fire-resistive construction.

STAGE HEIGHT is the dimension between the lowest point on the stage floor and the highest point of the underside of the roof or floor deck above the stage.

STAGE, LEGITIMATE, is a stage wherein curtains, drops, leg drops, scenery, lighting devices or other stage effects are retractable horizontally or suspended overhead and the stage height is greater than 50 feet (15 240 mm).

THEATER-IN-THE-ROUND is an acting area in the middle of a room with the audience sitting all around it.

405.1.3 Materials and design. Materials used in the construction of platforms and stages shall conform to the applicable materials and design requirements as set forth in this code. All assumed design live loads shall be indicated on the construction documents submitted for approval.

405.2 Platforms. Temporary platforms may be constructed of any materials. The space between the floor and the platform above shall not be used for any purpose other than electrical wiring or plumbing to platform equipment.

Platforms shall be constructed of materials as required for the type of construction of the building in which the platform is located. When the space beneath a raised platform is used for storage or any purpose other than equipment wiring or plumbing, the floor construction shall not be less than one-hour fire-resistive construction. When the space beneath the platform is not used for any purpose other than equipment wiring or plumbing, the underside of the platform shall be firestopped and may be constructed of any type of materials permitted by this code. The floor finish may be of wood in all types of construction.

405.3 Stages.

405.3.1 Construction. The minimum type of construction for stages shall be as required for the building except that the finish floor, in all types of construction, may be of wood.

Stages having a stage height of 50 feet (15 240 mm) or more shall be separated from the balance of the building by not less than a two-hour occupancy separation.

EXCEPTION: The opening in the proscenium wall used for viewing performances may be protected by a proscenium firesafety curtain conforming to U.B.C. Standard 4-1.

Where permitted by the building construction type or where the stage is separated from all other areas as required in the paragraph above, the stage floor may be of unprotected noncombustible or heavy-timber framing members with a minimum 1½ -inch-thick (38 mm) wood deck.

Where a stage floor is required to be on one-hour fire-resistive-rated construction, the stage floor may be unprotected when the space below the stage is sprinklered throughout.

Where the stage height is 50 feet (15 240 mm) or less, the stage area shall be separated from accessory spaces by a one-hour fire-resistive occupancy separation.

EXCEPTION: Control rooms and follow spot rooms may be open to the audience.

405.3.2 Accessory rooms. Dressing rooms, workshops, storerooms and other accessory spaces contiguous to stages shall be separated from each other and other building areas by a one-hour fire-resistive occupancy separation.

EXCEPTION: A separation is not required for stages having a floor area not exceeding 500 square feet.

405.3.3 Ventilation. Emergency ventilation shall be provided for all stage areas greater than 1,000 square feet (93 m²) or with a stage height of greater than 50 feet to provide a means of removing smoke and combustion gases directly to the outside in the event of a fire. Ventilation shall be by one or a combination of the following methods:

405.3.3.1 Smoke control. A means shall be provided to maintain the smoke level not less than 6 feet (1829 mm) above the highest level of assembly seating or above the top of the proscenium opening where proscenium wall and opening protection is provided. The system shall be activated independently by each of the following: (1) activation of the sprinkler system in the stage area and (2) by a manually operated switch at an approved location. The emergency ventilation system shall be connected to both normal and standby power. The fan(s) power wiring and ducts shall be located and properly protected to assure a minimum 20 minutes of operation in the event of activation.

405.3.3.2 Roof vents. Two or more vents shall be located near the center of and above the highest part of the stage area. They shall be raised above the roof and provide a net free vent area equal to 5 percent of the stage area. Vents shall be constructed to open automatically by approved heat-activated devices. Supplemental means shall be provided for manual operation of the ventilator from the stage floor. Vents shall be labeled by an approved agency.

405.3.4 Proscenium walls. The proscenium opening shall be protected by an approved fire curtain or an approved water curtain complying with U.B.C. Standard 4-1. The fire curtain shall be designed to close automatically upon automatic detection of a fire and upon manual activation and shall resist the passage of flame and smoke for 20 minutes between the stage area and the audience area.

405.3.5 Gridirons, fly galleries and pinrails. Beams designed only for the attachment of portable or fixed theater equipment, gridirons, galleries and catwalks shall be constructed of materials consistent with the building type of construction. A fire-resistance rating is not required.

EXCEPTION: Combustible materials shall be permitted for use as the floors of galleries and catwalks of all types of construction.

405.3.6 Flame-retardant requirements. Combustible scenery of cloth, film, dry vegetation and similar materials shall meet the requirements of the Fire Code. Foam plastics shall have a maximum heat release rate of 100 kilowatts.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0405, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0500 Chapter 5—General building limitations.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0500, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0510 Section 510—Heating.

510.1 Definitions. For the purposes of this section only, the following definitions apply.

DESIGNATED AREAS are those areas designated by a county to be an urban growth area in Chapter 36.70A RCW and those areas designated by the US Environmental Protection Agency as being in nonattainment for particulate matter.

SUBSTANTIALLY REMODELED means any alteration or restoration of a building exceeding 60 percent of the appraised value of such building within a 12 month period. For the purpose of this chapter, the appraised value is the value as defined in Section 223 of the Uniform Building Code.

510.2 Primary Heating Source. Primary heating sources in all new and substantially remodeled buildings in designated areas, shall not be dependent upon wood stoves.

510.3 Solid Fuel Burning Devices. No used solid fuel burning device shall be installed in new or existing buildings unless such device is either Oregon Department of Environmental Quality Phase II or United States Environmental Protection Agency certified or a pellet stove either certified or exempt from certification by the United States Environmental Protection Agency.

EXCEPTION: Antique wood cook stoves and heaters manufactured prior to 1940.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0510, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0600 Chapter 6—Types of construction.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0600, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0601 Section 601—Classification of all buildings by types of construction and general requirements.

601.1 General. The requirements of this chapter are for the various types of construction and represent varying degrees of public safety and resistance to fire. Every building shall be classified by the building official into one of the types of construction set forth in Table 6-A. Any building which does not entirely conform to a type of construction set forth in Table 6-A shall be classified by the building official into a type having an equal or lesser degree of fire resistance.

A building or portion thereof shall not be required to conform to the details of a type of construction higher than that type which meets the minimum requirements based on occupancy even though certain features of such building actually conform to a higher type of construction.

When specific materials, types of construction or fire-resistive protection are required, such requirements shall be the minimum requirements, and any materials, types of construction or fire-resistive protection which will afford equal or greater public safety or resistance to fire, as specified in this code, may be used.

For additional limitations or allowances for special uses or occupancies, see the following:

SECTION	SUBJECT
402	Atria
403	High-rise office buildings and Group R, Division 1 Occupancies
404	Malls
405	Open parking structures
307.11	Group H, Division 6 Occupancies
411	Aviation control structures
413	Agricultural buildings
3111	Membrane structures

601.2 Mixed Types of Construction. When a building contains more than one distinct type of construction, the area of the entire building shall not exceed the least area permitted for the types of construction involved.

EXCEPTION: Each portion of a building separated by one or more area separation walls as specified in Section 504.6 may be considered a separate building for the purpose of classification of types of construction. The fire-resistive time period for such type of construction separation shall not be less than the most restrictive requirement in Section 504.6.2 based on the types of construction involved.

601.3 Standards of Quality. The standards listed below labeled a "U.B.C. Standard" are also listed in Chapter 35, Part II, and are part of this code. The other standards listed below are recognized standards. (See Sections 3502 and 3503.)

1. **Building paper.**

1.1 U.B.C. Standard 14-1, Kraft Waterproof Building Paper

1.2 Asphalt-saturated Rag Felt, Underwriters Laboratories Inc. Standard Specification 55A, Materials for Construction of Built-up Roof Coverings

2. **Potential heat of building materials.**

U.B.C. Standard 26-1, Test Method to Determine Potential Heat of Building Materials

3. **Foam plastic tests.**

3.1 U.B.C. Standard 26-2, Test Method for the Evaluation of Thermal Barriers, Standard of the International Conference of Building Officials

3.2 Factory Mutual Standard Fire Test Standard for Insulted Roof Deck Construction

3.3 Underwriters Laboratories Inc. 1256, Fire Test Standard for Insulated Roof Deck Construction

3.4 U.B.C. Standard 26-3, Room Fire Test Standard for Interior Foam Plastic Systems, Standard of the International Conference of Building Officials

3.5 U.B.C. Standard 26-4, Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonloadbearing Wall Panel Assemblies Using Foam Plastic Insulation, Test Standard of the International Conference of Building Officials

4. **Roof coverings.**

4.1 Underwriters Laboratories Inc. Standard Specification 55A, Materials for Use in Construction of Built-up Roof Coverings

4.2 U.B.C. Standard 15-2, Test Standard for Determining the Fire Retardancy of Roof Covering Material

5. **Surface-burning characteristics and fire resistance of building materials and assemblies.**

5.1 U.B.C. Standard 8-1, Test Method for Surface-burning Characteristics of Building Materials

5.2 U.B.C. Standard 7-1, Fire Test of Building Construction and Materials

6. **Self-ignition properties of plastics.**

ASTM D 1929, Ignition Properties of Plastics

7. **Fire dampers.**

UL 555, Fire Dampers

601.4 Structural Frame. The structural frame shall be considered to be the columns and the girders, beams, trusses and spandrels having direct connections to the columns and all other members which are essential to the stability of the building as a whole. The members of floor or roof panels which have no connection to the columns shall be considered secondary members and not a part of the structural frame.

601.5 Exceptions to Table 6-A.

601.5.1 General. The provisions of this section are exceptions to the construction requirements of Table 6-A, Chapter 3 and Sections 602 through 606.

601.5.2 Fixed partitions.

601.5.2.1 Stores and offices. Interior nonload-bearing partitions dividing portions of stores, offices or similar places occupied by one tenant only and which do not establish a corridor serving an occupant load that would require it to be of fire-resistive construction under the provisions of Section 1005.7 may be constructed of:

1. Noncombustible materials.

2. Fire-retardant-treated wood.

3. One-hour fire-resistive construction.

4. Wood panels or similar light construction up to three fourths the height of the room in which placed; when more than three fourths the height of the room, such partitions shall not have less than the upper one fourth of the partition constructed of glass.

601.5.2.2 Hotels and apartments. Interior nonload-bearing partitions within individual dwelling units in apartment houses and guest rooms or suites in hotels when such dwelling units, guest rooms or suites are separated from each other and from corridors by not less than one-hour fire-resistive construction may be constructed of:

1. Noncombustible materials or fire-retardant-treated wood in buildings of any type of construction; or

2. Combustible framing with noncombustible materials applied to the framing in buildings of Type III or V construction.

Openings to such corridors shall be equipped with doors conforming to Section 1005.8 regardless of the occupant load served.

For use of plastics in partitions, see Section 2603.10.

601.5.3 Folding, portable or movable partitions. Approved folding, portable or movable partitions need not have a fire-resistive rating, provided:

1. They do not block required exits (without providing alternative conforming exits) and they do not establish an exit corridor.

2. Their location is restricted by means of permanent tracks, guides or other approved methods.

3. Flammability shall be limited to materials having a flame-spread classification as set forth in Table 8-B for rooms or areas.

601.5.4 Walls fronting on streets or yards. Regardless of fire-resistive requirements for exterior walls, certain elements of the walls fronting on streets or yards having a width of 40 feet (12 192 mm) may be constructed as follows:

1. Bulkheads below show-windows, show-window frames, aprons and showcases may be of combustible materials, provided the height of such construction does not exceed 15 feet (4572 mm) above grade.

2. Wood veneer of boards not less than 1-inch (25 mm) nominal thickness or exterior-type panels not less than 3/8-inch (9.5 mm) nominal thickness may be applied to walls, provided the veneer does not exceed 15 feet (4572 mm) above grade, and further provided such veneer shall be placed either directly against noncombustible surfaces or furred out from such surfaces not to exceed 1 5/8 inches (41 mm) with all concealed spaces fire-blocked as provided in Section 708. Where boards, panels and furring as described above comply with Section 207 as fire-retardant-treated wood suitable for exterior exposure, the height above grade may be increased to 35 feet (10 668 mm).

601.5.5 Trim. Trim, picture molds, chair rails, baseboards, handrails and show-window backing may be of wood. Unprotected wood doors and windows may be used except where openings are required to be fire protected.

Foam plastic trim covering not more than 10 percent of the wall or ceiling area may be used, provided such trim (1) has a density of no less than 20 pounds per cubic foot (320.4 kg/m^3), (2) has a maximum thickness of 1/2 inch (12.7 mm) and a maximum width of 4 inches (102 mm) and (3) has a flame-spread rating no greater than 75.

Materials used for interior finish of walls and ceilings, including wainscoting, shall be as specified in Chapter 8.

601.5.6 Loading platforms. Exterior loading platforms may be of noncombustible construction or heavy-timber construction with wood floors not less than 2-inch (51 mm) nominal thickness. Such wood construction shall not be carried through the exterior walls.

601.5.7 Insulating boards. Combustible insulating boards may be used under finished flooring.

601.5.8 Walls within health-care suites. In suites that comply with Section 1019.7, interior non-load-bearing partitions of non-combustible construction need not be of fire-resistive construction. In buildings of combustible construction, interior non-load-bearing partitions within suites may be of combustible framing covered with non-combustible materials having an approved thermal barrier with an index of 15 in accordance with U.B.C. Standard 26-2. One-half-inch gypsum wallboard is acceptable as a thermal barrier.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0601, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0800 Chapter 8—Interior finishes.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0800, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0804 Section 804—Maximum allowable flame spread.

804.1 General. The maximum flame-spread class of finish materials used on interior walls and ceilings shall not exceed that set forth in Table 8-B.

EXCEPTIONS:
1. Except in Group I Occupancies and in enclosed vertical exitways, Class III may be used in other exitways and rooms as wainscoting extending not more than 48 inches (1219 mm) above the floor and for tack and bulletin boards covering not more than 5 percent of the gross wall area of the room.
2. In other than Group I, Division 1.1, 1.2 or 2 suites complying with Section 1019.7, when a sprinkler system complying with U.B.C. Standard 9-1 or 9-3 is provided, the flame-spread classification rating may be reduced one classification, but in no case shall materials having a classification greater than Class III be used.
3. The exposed faces of Type IV-H.T., structural members and Type IV-H.T., decking and planking, where otherwise permissible under this code, are excluded from flame-spread requirements.

804.2 Carpeting on ceilings. When used as interior ceiling finish, carpeting and similar materials having a napped, tufted, looped or similar surface shall have a Class I flame spread.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0804, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0900 Chapter 9—Fire-protection systems.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0900, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0902 Section 902—Standards of quality.

Fire-extinguishing systems, including automatic sprinkler systems, Class I, Class II and Class III standpipe systems, special automatic extinguishing systems, basement pipe inlets, smoke-control systems, and smoke and heat vents shall be approved and shall be subject to such periodic tests as may be required.

The standards listed below labeled a "U.B.C. Standard" are also listed in Chapter 35, Part II, and are part of this code. The other standards listed below are recognized standards (see Sections 3502 and 3503).

1. Fire-extinguishing system.

1.1 U.B.C. Standard 9-1, Installation of Sprinkler Systems

1.2 U.B.C. Standard 9-3, Installation of Sprinkler Systems in Group R Occupancies Four Stories or Less

1.3 N.F.P.A. Standard 13d, as published by the National Fire Protection Association, 1994 edition

2. Standpipe systems.

U.B.C. Standard 9-2, Standpipe Systems

3. Smoke control.

3.1 U.B.C. Standard 7-2, Fire Test of Door Assemblies

3.2 UL 555, Fire Dampers

3.3 UL 555C, Ceiling Dampers

3.4 UL 555S, Leakage Rated Dampers for Use in Smoke Control Systems

3.5 UL 33, Heat Response Links for Fire Protection Service

3.6 UL 353, Limit Controls

4. Smoke and heat vents.

U.B.C. Standard 15-7, Automatic Smoke and Heat Vents

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0902, filed 12/21/94, effective 6/30/95.]

WAC 51-30-0904 Section 904—Fire-extinguishing systems.

904.1 Installation Requirements.

904.1.1 General. Fire-extinguishing systems required in this code shall be installed in accordance with the requirements of this section.

Fire hose threads used in connection with fire-extinguishing systems shall be national standard hose thread or as approved by the fire department.

The location of fire department hose connections shall be approved by the fire department.

In buildings used for high-piled combustible storage, fire protection shall be in accordance with the Fire Code.

904.1.2 Standards. Fire-extinguishing systems shall comply with U.B.C. Standards 9-1 and 9-2.

EXCEPTIONS:
1. Automatic fire-extinguishing systems not covered by U.B.C. Standards 9-1 or 9-2 shall be approved and installed in accordance with approved standards.
2. Automatic sprinklers systems may be connected to the domestic water-supply main when approved by the building official, provided the domestic water supply is of adequate pressure, capacity and sizing for the combined domestic and sprinkler requirements. In such case, the sprinkler system connection shall be made between the public water main or meter and the building shutoff valve, and there shall not be intervening valves or connections. The fire department connection may be omitted when approved by the fire department.

3. Automatic sprinkler systems in Group R Occupancies four stories or less may be in accordance with U.B.C. Standard 9-3.

904.1.3 Modifications. When residential sprinkler systems as set forth in U.B.C. Standard 9-3 are provided, exceptions to, or reductions in, code requirements based on the installation of an automatic fire-extinguishing system are not allowed.

904.2 Automatic Fire-extinguishing Systems.

904.2.1 Where required. An automatic fire-extinguishing system shall be installed in the occupancies and locations as set forth in this section.

For provisions on special hazards and hazardous materials, see the Fire Code.

904.2.2 All occupancies except Group R, Division 3 and Group U Occupancies. Except for Group R, Division 3 and Group U Occupancies, an automatic sprinkler system shall be installed:

1. In every story or basement of all buildings when the floor area exceeds 1,500 square feet (139.4 m²) and there is not provided at least 20 square feet (1.86 m²) of opening entirely above the adjoining ground level in each 50 lineal feet (15 240 mm) or fraction thereof of exterior wall in the story or basement on at least one side of the building. Openings shall have a minimum dimension of not less than 30 inches (762 mm). Such openings shall be accessible to the fire department from the exterior and shall not be obstructed in a manner that fire fighting or rescue cannot be accomplished from the exterior.

When openings in a story are provided on only one side and the opposite wall of such story is more than 75 feet (22 860 mm) from such openings, the story shall be provided with an approved automatic sprinkler system, or openings as specified above shall be provided on at least two sides of an exterior wall of the story.

If any portion of a basement is located more than 75 feet (22 860 mm) from openings required in this section, the basement shall be provided with an approved automatic sprinkler system.

2. At the top of rubbish and linen chutes and in their terminal rooms. Chutes extending through three or more floors shall have additional sprinkler heads installed within such chutes at alternate floors. Sprinkler heads shall be accessible for servicing.

3. In rooms where nitrate film is stored or handled.

4. In protected combustible fiber storage vaults as defined in the Fire Code.

5. Throughout all buildings with a floor used for human occupancy that is located 75 feet (22 860 mm) or more above the lowest level of fire department vehicle access.

EXCEPTIONS:
1. Airport control towers.
2. Open parking structures.
3. Group F, Division 2 Occupancies.

904.2.3 Group A Occupancies.

904.2.3.1 Drinking establishments. An automatic sprinkler system shall be installed in rooms used by the occupants for the consumption of alcoholic beverages and unseparated accessory uses where the total area of such unseparated rooms and assembly uses exceeds 5,000 square feet (465 m²). For uses to a be considered as separated, the separation shall not be less than as required for a one-hour occupancy separation. The area of other uses shall be included unless separated by at least a one-hour occupancy separation.

904.2.3.2 Basements. An automatic sprinkler system shall be installed in basements classified as a Group A Occupancy when the basement is larger than 1,500 square feet (139 m²) in floor area.

904.2.3.3 Exhibition and display rooms. An automatic sprinkler system shall be installed in Group A Occupancies which have more than 12,000 square feet (1114 m²) of floor area which can be used for exhibition or display purposes.

904.2.3.4 Stairs. An automatic sprinkler system shall be installed in enclosed usable space below or over a stairway in Group A, Divisions 2, 2.1, 3 and 4 Occupancies. See Section 1009.6.

904.2.3.5 Multitheater complexes. An automatic sprinkler system shall be installed in every building containing a multitheater complex.

904.2.3.6 Amusement buildings. An automatic sprinkler system shall be installed in all amusement buildings. The main water-flow switch shall be electrically supervised. The sprinkler main cutoff valve shall be supervised. When the amusement building is temporary, the sprinkler water-supply system may be of an approved temporary type.

EXCEPTION: An automatic sprinkler system need not be provided when the floor area of a temporary amusement building is less than 1,000 square feet (92.9 m²) and the exit travel distance from any point is less than 50 feet (15 240 mm).

904.2.3.7 Stages. All stages shall be sprinklered. Such sprinklers shall be provided throughout the stage and in dressing rooms, workshops, storerooms and other accessory spaces contiguous to such stages.

EXCEPTIONS:
1. Sprinklers are not required for stages 1,000 square feet (92.9 m²) or less in area and 50 feet (15 240 mm) or less in height where curtains, scenery or other combustible hangings are not retractable vertically. Combustible hangings shall be limited to a single main curtain, borders, legs and a single backdrop.
2. Under stage areas less than 4 feet (1219 mm) in clear height used exclusively for chair or table storage and lined on the inside with 5/8-inch (16 mm) Type X gypsum wallboard or an approved equal.

904.2.4 Group E Occupancies.

904.2.4.1 General. An automatic fire-extinguishing system shall be installed in all newly constructed buildings classified as Group E, Division 1 Occupancy. A minimum water supply meeting the requirements of U.B.C. Standard 9-1 shall be required. The chief of the fire department may reduce fire flow requirements for buildings protected by an approved automatic sprinkler system.

For the purpose of this section, additions exceeding 60 percent of the value of such building or structure, or alterations and repairs to any portion of a building or structure within a twelve-month period that exceeds 100 percent of the value of such building or structure shall be considered new

construction. In the case of additions, area separation walls shall define separate buildings.

EXCEPTION: Portable school classrooms, provided:
1. Aggregate area of clusters of portable school classrooms does not exceed 5,000 square feet (1465 m²); and
2. Clusters of portable school classrooms shall be separated as required in Chapter 5.

When not required by other provisions of this chapter, a fire-extinguishing system installed in accordance with U.B.C. Standard 9-1 may be used for increases allowed in Chapter 5.

904.2.4.2 Basements. An automatic sprinkler system shall be installed in basement classified as Group E, Division 1 Occupancies.

904.2.4.3 Stairs. An automatic fire sprinkler system shall be installed in enclosed usable space below or over a stairway in Group E, Division 1 Occupancies. See Section 1009.6.

904.2.5 Group H Occupancies.

904.2.5.1 General. An automatic fire-extinguishing system shall be installed in Group H, Divisions 1, 2, 3 and 7 Occupancies.

904.2.5.2 Group H, Division 4 Occupancies. An automatic fire-extinguishing system shall be installed in Group H, Division 4 Occupancies having a floor area of more than 3,000 square feet (279 m²).

904.2.5.3 Group H, Division 6 Occupancies. An automatic fire-extinguishing system shall be installed throughout buildings containing Group H, Division 6 Occupancies. The design of the sprinkler system shall not be less than that required under U.B.C Standard 9-1 for the occupancy hazard classification as follows:

LOCATION	OCCUPANCY HAZARD CLASSIFICATION
Fabrication areas	Ordinary Hazard Group 2
Service Corridors	Ordinary Hazard Group 2
Storage rooms without dispensing	Ordinary Hazard Group 2
Storage rooms with dispensing	Extra Hazard Group 2
Exit corridors	Ordinary Hazard Group 2[1]

[1]When the design area of the sprinkler system consists of a corridor protected by one row of sprinklers, the maximum number of sprinklers that need to be calculated is 13.

904.2.6 Group I Occupancies. An automatic sprinkler system shall be installed in Group I Occupancies. Listed quick response sprinklers shall be installed in light hazard areas in accordance with their listing.

EXCEPTION: In jails, prisons and reformatories, the piping system may be dry, provided a manually operated valve is installed at a continuously monitored location. Opening of the valve will cause the piping system to be charged. Sprinkler heads in such systems shall be equipped with fusible elements or the system shall be designed as required for deluge systems in U.B.C. Standard 9-1.

904.2.7 Group M Occupancies. An automatic sprinkler shall be installed in retail sales rooms classed as Group M Occupancies where the floor area exceeds 12,000 square feet (1114 m²) on any floor or 24,000 square feet (2228 m²) on all floors or in Group M retail sales occupancies more than three stories in height. The area of mezzanines shall be included in determining the area where sprinklers are required.

904.2.8 Group R, Division 1 Occupancies. An automatic sprinkler system shall be installed throughout every apartment house three or more stories in height or containing 16 or more dwelling units, every congregate residence three or more stories in height or having an occupant load of 20 or more, and every hotel three or more stories in height or containing 20 or more guest rooms. Residential or quick-response standard sprinklers shall be used in the dwelling units and guest room portions of the building.

904.3 Sprinkler System Monitoring and Alarms.

904.3.1 Where required. All valves controlling the water supply for automatic sprinkler systems and water-flow switches on all sprinkler systems shall be electrically monitored where the number of sprinklers are:

1. Twenty or more in Group I, Divisions 1.1 and 1.2 Occupancies.

2. One hundred or more in all other occupancies.

Valve monitoring and water-flow alarm and trouble signals shall be distinctly different and shall be automatically transmitted to an approved central station, remote station or proprietary monitoring station as defined by national standards, or, when approved by the building official with the concurrence of the chief of the fire department, sound an audible signal at a constantly attended location.

EXCEPTION: Underground key or hub valves in roadway boxes provided by the municipality or public utility need not be monitored.

904.3.2 Alarms. An approved audible sprinkler flow alarm shall be provided on the exterior of the building in an approved location. An approved audible sprinkler flow alarm to alert the occupants shall be provided in the interior

of the building in a normally occupied location. Actuation of the alarm shall be as set forth in U.B.C. Standard 9-1.

904.4 Permissible Sprinkler Omissions. Subject to the approval of the building official and with the concurrence of the chief of the fire department, sprinklers may be omitted in rooms or areas as follows:

1. When sprinklers are considered undesirable because of the nature of the contents or in rooms or areas which are of noncombustible construction with wholly noncombustible contents and which are not exposed by other areas. Sprinklers shall not be omitted from any room merely because it is damp, of fire-resistive construction or contains electrical equipment.

2. Sprinklers shall not be installed when the application of water or flame and water to the contents may constitute a serious life or fire hazard, as in the manufacture or storage of quantities of aluminum powder, calcium carbide, calcium phosphide, metallic sodium and potassium, quick-lime, magnesium powder and sodium peroxide.

3. Safe deposit or other vaults of fire-resistive construction, when used for the storage of records, files and other documents, when stored in metal cabinets.

4. Communication equipment areas under the exclusive control of a public communication utility agency, provided:

4.1 The equipment areas are separated from the remainder of the building by one-hour fire-resistive occupancy separation; and

4.2 Such areas are used exclusively for such equipment; and

4.3 An approved automatic smoke-detection system is installed in such areas and is supervised by an approved central, proprietary or remote station service or a local alarm which will give an audible signal at a constantly attended location; and

4.4 Other approved fire-protection equipment such as portable fire extinguishers or Class II standpipes are installed in such areas.

5. Other approved automatic fire-extinguishing systems may be installed to protect special hazards or occupancies in lieu of automatic sprinklers.

904.5 Standpipes.

904.5.1 General. Standpipes shall comply with the requirements of this section and U.B.C. Standard 9-2.

904.5.2 Where required. Standpipe systems shall be provided as set forth in Table 9-A.

904.5.3 Location of Class I standpipes. There shall be a Class I standpipe outlet connection at every floor-level landing or every required stairway above or below grade and on each side of the wall adjacent to the exit opening of a horizontal exit. Outlets at stairways shall be located within the exit enclosure or, in the case of pressurized enclosures, within the vestibule or exterior balcony, giving access to the stairway.

Risers and laterals of Class I standpipe systems not located within an enclosed stairway or pressurized enclosure shall be protected by a degree of fire resistance equal to that required for vertical enclosures in the building in which they are located.

EXCEPTION: In buildings equipped with an approved automatic sprinkler system, risers and laterals which are not located within an enclosed stairway or pressurized enclosure need not be enclosed within fire-resistive construction.

There shall be at least one outlet above the roof line when the roof has a slope of less than 4 units vertical in 12 units horizontal (33.3% slope).

In buildings where more than one standpipe is provided, the standpipes shall be interconnected at the bottom.

904.5.4 Location of Class II standpipes. Class II standpipe outlets shall be accessible and shall be located so that all portions of the building are within 30 feet (9144 mm) of a nozzle attached to 100 feet (30 480 mm) of hose.

In Group A, Divisions 1 and 2.1 Occupancies, with occupant loads of more than 1,000, outlets shall be located on each side of any stage, on each side of the rear of the auditorium and on each side of the balcony.

Fire-resistant protection of risers and laterals of Class II standpipe systems is not required.

904.5.5 Location of Class III standpipes. Class III standpipe systems shall have outlets located as required for Class I standpipes in Section 904.5.3 and shall have Class II outlets as required in Section 904.5.4.

Risers and laterals of Class III standpipe systems shall be protected as required for Class I systems.

EXCEPTIONS: 1. In buildings equipped with an approved automatic sprinkler system, risers and laterals which are not located within an enclosed stairway or pressurized enclosure need not be enclosed within fire-resistive construction.
2. Laterals for Class II outlets on Class III systems need not be protected.

In buildings where more than one Class III standpipe is provided, the standpipes shall be interconnected at the bottom.

904.6 Buildings under Construction.

904.6.1 General. During the construction of a building and until the permanent fire-extinguishing system has been installed and is in service, fire protection shall be provided in accordance with this section.

904.6.2 Where required. Every building four stories or more in height shall be provided with not less than one standpipe for use during construction. Such standpipes shall be installed when the progress of construction is not more than 35 feet (10 668 mm) in height above the lowest level of fire department access. Such standpipe shall be provided with fire department hose connections at accessible locations adjacent to usable stairs and the standpipe outlets shall be located adjacent to such usable stairs. Such standpipe systems shall be extended as construction progresses to within one floor of the highest point of construction having secured decking or flooring.

In each floor there shall be provided a 2 1/2-inch (63.5 mm) valve outlet for fire department use. Where construction height requires installation of a Class III standpipe, fire

pumps and water main connections shall be provided to serve the standpipe.

904.6.3 Temporary standpipes. Temporary standpipes may be provided in place of permanent systems if they are designed to furnish a minimum of 500 gallons (1893 L) of water per minute at 50 pounds per square inch (345 kPa) pressure with a standpipe size of not less than 4 inches (102 mm). All outlets shall not be less than 2 1/2-inches (63.5 mm). Pumping equipment sufficient to provide this pressure and volume shall be available at all times when a Class III standpipe system is required.

904.6.4 Detailed requirements. Standpipe systems for buildings under construction shall be installed as required for permanent standpipe systems.

904.7 Basement Pipe Inlets. For basement pipe inlet requirements, see Appendix Section 907.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-0904, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1000 Chapter 10—Means of egress.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1000, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1001 Section 1001—General.

1001.1 Scope and Standards of Quality. Every building or portion thereof shall be provided with exits as required by this chapter.

The standards listed below labeled a "U.B.C. standard" are also listed in Chapter 35, Part II, and are part of this code. The other standards listed below are recognized standards and as such are not adopted as part of this code (see Sections 3502 and 3503).

1. **Power doors.**

1.1 U.B.C. Standard 10-1, Power-operated Exit Doors

1.2 U.B.C. Standard 7-8, Horizontal Sliding Fire Doors Used in an Exit

2. **Stairway numbering system.**

U.B.C. Standard 10-2, Stairway Identification

3. **Hardware.**

U.B.C. Standard 10-4, Panic Hardware

1001.2 Definitions. For the purpose of this chapter, certain terms are defined as follows:

BALCONY, EXTERIOR EXIT, is a landing or porch projecting from the wall of a building, and which serves as a required exit. The long side shall be at least 50 percent open, and the open area above the guardrail shall be so distributed as to prevent the accumulation of smoke or toxic gases.

EXIT is a continuous and unobstructed means of egress to a public way and shall include intervening aisles, doors, doorways, gates, corridors, exterior exit balconies, ramps, stairways, pressurized enclosures, horizontal exits, exit passageways, exit courts and yards.

EXIT COURT is a yard or court providing access to a public way for one or more required exits.

EXIT PASSAGEWAY is an enclosed exit connecting a required exit or exit court with a public way.

EXTERIOR STAIRWAY is a stairway that is open on two adjacent sides, except for required structural columns and open-type handrails and guardrails. The adjoining open areas shall be either yards, courts or public ways; the other two sides may be enclosed by the exterior walls of the building.

HORIZONTAL EXIT is an exit from one building into another building on approximately the same level, or through or around a wall constructed as required for a two-hour occupancy separation and which completely divides a floor into two or more separate areas so as to establish an area of refuge affording safety from fire or smoke coming from the area from which escape is made.

INTERIOR STAIRWAY is any stairway not meeting the definition of an exterior stairway.

MULTITHEATER COMPLEX is a building or portion thereof containing two or more motion picture auditoriums which are served by a common lobby.

PANIC HARDWARE is a door-latching assembly incorporating an unlatching device, the activating portion of which extends across at least one half the width of the door leaf on which it is installed.

PRIVATE STAIRWAY is a stairway serving one tenant only.

PUBLIC WAY is any street, alley or similar parcel of land essentially unobstructed from the ground to the sky which is deeded, dedicated or otherwise permanently appropriated to the public for public use and having a clear width of not less than 10 feet (3048 mm).

SMOKE-PROTECTED ASSEMBLY SEATING is an assembly area wherein the roof is not less than 15 feet (4500 mm) above the highest cross aisle or seat row, and having smoke-actuated venting facilities within that part of the roof sufficient to maintain the level of smoke at least 6 feet (1830 mm) above the highest seat or walking level.

SPIRAL STAIRWAY is a stairway having a closed circular form in its plan view with uniform section shaped treads attached to and radiating about a minimum diameter supporting column. The effective tread is delineated by the nosing radius line, the exterior arc (center line of railing) and the overlap radius line (nosing radius line of tread above). Effective tread dimensions are taken along a line perpendicular to the center line of the tread.

TRAVEL DISTANCE is the total length of the exit path an occupant must travel from any point within the occupied portions of a building to reach an exterior exit door, horizontal exit door, exit passageway door or an enclosed exit stairway door.

1001.3 Exit Obstruction. Obstructions shall not be placed in the required width of an exit except projections permitted by this chapter.

1001.4 Changes in Elevation. Elevation changes in an exit shall comply with Section 1006.3 or 1007.

Within a building, changes in elevation of less than 12 inches (305 mm) along an exit serving an occupant load of 10 or more shall be by ramps.

EXCEPTION: Group R, Division 3 Occupancies and along aisles adjoining seating areas.

1001.5 Guardrails. See Section 509 for guardrail requirements.

1001.6 Yards, Patios and Courts. Yards, patios, courts and similar outdoor areas accessible to and usable by the building occupants shall be provided with exits as required by this chapter. The occupant load of such outdoor areas shall be assigned by the building official in accordance with their anticipated use. When outdoor areas are to be used by persons in addition to the occupants of the building, and exits from the outdoor areas pass through the building, exit requirements for the building shall be based on the sum of the occupant loads of the building plus the outdoor areas.

EXCEPTION: 1. Outdoor areas used exclusively for service of the building may have one exit.
2. Outdoor areas associated with Group R, Division 3 Occupancies.

1001.7 Building Accessibility. In addition to provisions of this chapter, exits which provide access to, or egress from, buildings for persons with disabilities shall also comply with Chapter 11.

1001.8 Elevators or Escalators. Elevators or escalators shall not be used as a required exit.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1001, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1004 Section 1004—Doors.

1004.1 General. This section shall apply to every exit door serving an area having an occupant load of 10 or more, or serving hazardous rooms or areas, except that Sections 1004.3, 1004.9, 1004.10 and 1004.11 shall apply to all exit doors, and Sections 1004.2 shall apply to all exit doors within an accessible route, regardless of occupant load. Buildings or structures used for human occupancy shall have at least one exterior exit door that meets the requirements of Section 1004.6. Doors and landings at doors which are located within an accessible route of travel shall also comply with Chapter 11.

1004.2 Swing and Opening Force. Exit doors that serve an area having an occupant load of 10 or more shall be of the pivoted or side-hinged swinging type. Exit doors shall swing in the direction of exit travel when serving any hazardous area or when the area served has an occupant load of 50 or more. The door shall swing to full-open position when an opening force not to exceed 30 pounds (133.45 N) is applied to the latch side. Within an accessible route, such force shall not exceed 8.5 pounds (37.8 N) at exterior doors; and shall not exceed 5 pounds (22.24 N) at sliding and folding doors and interior swinging doors. At exterior doors where environmental conditions require greater closing pressure, power-operated doors shall be used within the accessible route. For other door-opening forces, see Chapter 11 and Section 905.3. See Section 3207 for doors swinging over public property.

EXCEPTIONS: 1. Group I, Division 3 Occupancy used as a place of detention.
2. In other than accessible dwelling units, doors within or serving an individual dwelling unit.
3. Special door conforming with Section 1004.8.
4. The opening force at required fire doors within an accessible route may be not greater than 30 pounds (133.45 N).

Double-acting doors shall not be used as exits when any of the following conditions exist:

1. The occupant load served by the door is 100 or more.

2. The door is part of a fire assembly.

3. The door is part of a smoke-draft-control assembly.

4. Panic hardware is required or provided on the door.

A double-acting door shall be provided with a view panel of not less than 200 square inches (0.129 m^2).

1004.3 Type of Lock or Latch. Exit doors shall be openable from the inside without the use of a key or any special knowledge or effort.

EXCEPTIONS: 1. In Groups B, F, M and S Occupancies, key-locking hardware may be used on the main exit when the main exit consists of a single door or pair of doors if there is a readily visible, durable sign on or adjacent to the door stating THIS DOOR MUST REMAIN UNLOCKED DURING BUSINESS HOURS. The sign shall be in letters not less than 1 inch (25 mm) high on a contrasting background. When unlocked, the single door or both leaves of a pair of doors must be free to swing without operation of any latching device. The use of this exception may be revoked by the building official for due cause.
2. Exit doors from individual dwelling units; Group R, Division 3 congregate residences; and guest rooms of Group R Occupancies having an occupant load of 10 or less may be provided with a night latch, dead bolt or security chain, provided such devices are openable form the inside without the use of a key or tool and mounted at a height not to exceed 48 inches (1219 mm) above the finished floor.

Manually operated edge- or surface-mounted flush bolts and surface bolts are prohibited. When exit doors are used in pairs and approved automatic flush bolts are used, the door leaf having the automatic flush bolts shall have no doorknob or surface-mounted hardware. The unlatching of any leaf shall not require more than one operation.

EXCEPTIONS: 1. Group R, Division 3 Occupancies.
2. When a pair of doors serving a room not normally occupied are needed of the movement of equipment, manually operated edge or surface bolts may be used and a door closer need not be provided on the inactive leaf.

1004.4 Panic Hardware. Panic hardware, when installed, shall comply with the requirements of U.B.C. Standard 10-4. The activating member shall be mounted at a height of not less than 30 inches (762 mm) or more than 44 inches (1118 mm) above the floor. The unlatching force shall not exceed 15 pounds (66.72 N) when applied in the direction of exit travel.

When balanced doors are used and panic hardware is required, panic hardware shall be of the push-pad type and

the pad shall not extend across more than one half of the width of the door measured from the latch side.

1004.5 Special Egress-control Devices. When approved by the building official, exit doors in Group B; F, Division 1; Group I, Divisions 1.1, 1.2 and 2; Group M and Group LC Occupancies may be equipped with approved listed special egress-control devices, provided the building is protected throughout by an approved automatic sprinkler system and an approved automatic smoke-detection system. Such devices shall conform to all of the following:

1. Automatically deactivate the egress-control device upon activation of either the sprinkler system or the detection system.

2. Automatically deactivate the egress-control device upon loss of electrical power to any one of the following:

2.1 The egress-control device.

2.2 The smoke-detection system.

2.3 Exit illumination as required by Section 1012.

3. Be capable of being deactivated by a signal from a switch located in an approved location.

4. Initiate an irreversible process which will deactivate the egress-control device whenever a manual force of not more than 15 pounds (66.72 N) is applied for two seconds to the panic bar or other door-latching hardware. The egress-control device shall deactivate within an approved time period not to exceed a total of 15 seconds. The time delay established for each egress-control device shall not be field adjustable.

5. Actuation of the panic bar or other door-latching hardware shall activate an audible signal at the door.

6. The unlatching shall not require more than one operation.

A sign shall be provided on the door located above and within 12 inches (305 mm) of the panic bar or other door-latching hardware reading:

KEEP PUSHING. THE DOOR WILL OPEN IN ___ SECONDS. ALARM WILL SOUND.

Sign letter shall be at least 1 inch (25 mm) in height and shall have a stroke of not less than 1/8 inch (3.2 mm).

Regardless of the means of deactivation, relocking of the egress-control device shall be by manual means only at the door.

EXCEPTION: Subject to the approval of the building official, special units for the care of dementia patients in nursing homes which are identified and approved by the state agency licensing such units, may use special egress-control devices where a panic bar is not part of the egress-control mechanism.

1004.6 Width and Height. Every required exit doorway shall be of a size as to permit the installation of a door not less than 3 feet (914 mm) in width and not less than 6 feet 8 inches (2032 mm) in height. When installed, exit doors shall be capable of opening so that the clear width of the exit is not less than 32 inches (813 mm). In computing the exit width required by Section 1003.2, the net dimension of the exitway shall be used.

1004.7 Door Leaf Width. A single leaf of an exit door shall not exceed 4 feet (1219 mm) in width.

1004.8 Special Doors. Revolving, sliding and overhead doors shall not be used as required exits. Where revolving or overhead doors or turnstiles are used, an adjacent accessible gate or door shall be provided where an accessible route is required by Chapter 11.

EXCEPTION: Horizontal sliding doors complying with U.B.C. Standard 7-8 may be used:
1. In elevator lobby separations.
2. Other than Group A and H Occupancies, where smoke barriers are required.
3. When serving an occupant load of less than 50 in any occupancy other than a Group H Occupancy.

Power-operated doors complying with U.B.C. Standard 10-1 may be used for exit purposes. Such doors when swinging shall have two guide rails installed on the swing side projecting out from the face of the door jambs for a distance not less than the widest door leaf. Guide rails shall not be less than 30 inches (762 mm) in height with solid or mesh panels to prevent penetration into door swing and shall be capable of resisting a horizontal load at top of rail of not less than 50 pounds per lineal foot (730 N/m).

EXCEPTIONS: 1. Walls or other type separators may be used in lieu of the above guide rail, provided all the criteria are met.
2. Guide rails in industrial or commercial occupancies not accessible to the public may conform with the exception to Section 509.3.
3. Doors swinging toward flow of traffic shall not be permitted for use by untrained pedestrian traffic unless actuating devices start to function at least 8 feet 11 inches (2718 mm) beyond the door in an open position and guide rails extend 6 feet 5 inches (1956 mm) beyond the door in an open position.

Clearances for guide rails shall be as follows:

1. Six inches (152 mm) maximum between rails and leading edge of door at the closest point in its arc of travel.

2. Six inches (152 mm) maximum between rails and the door in an open position.

3. Two inches (51 mm) minimum between rail at hinge side and door in an open position.

4. Two inches (51 mm) maximum between freestanding rails and jamb or other adjacent surface.

1004.9 Floor Level at Doors. Regardless of the occupant load, there shall be a floor or landing on each side of a door. When access for persons with disabilities is required by Chapter 11, the floor or landing shall not be more than 1/2 inch (13 mm) lower than the threshold of the doorway. When such access is not required, such dimension shall not exceed 1 inch (25 mm). Landings shall be level except for exterior landings, which may have a slope not to exceed 1/4 unit vertical in 12 units horizontal (2% slope).

EXCEPTIONS: 1. In Group R, Division 3, and Group U Occupancies and within individual units of Group R, Division 1 Occupancies:
1.1. A door may open at the top of an interior flight of stairs, provided the door does not swing over the top step.

1.2. A door may open at a landing that is not more than 8 inches (203 mm) lower than the floor level, provided the door does not swing over the landing.
1.3. Screen doors and storm doors may swing over stairs, steps or landings.
2. Doors serving building equipment rooms which are not normally occupied.
3. At exterior sliding doors within accessible dwelling units, the floor or landing may be no more than 3/4 inch (19 mm) lower than the threshold of the doorway, including the sliding door tracks, provided that an additional accessible entrance door is provided into the dwelling unit.

1004.10 Landings at Doors. Landings shall have a width of not less than the width of the stairway or the width of the door, whichever is the greater. Doors in the fully open position shall not reduce a required dimension by more than 7 inches (178 mm). When a landing serves an occupant load of 50 or more, doors in any position shall not reduce the landing dimension to less than one half its required width. Landings shall have a length measured in the direction of travel of not less than 44 inches (1118 mm).

EXCEPTION: In Group R, Division 3, and Group U Occupancies and within individual units of Group R, Division 1 Occupancies, such length need not exceed 36 inches (914 mm).

A landing which has no adjoining door shall comply with Section 1006.7.

1004.11 Door Identification. Glass doors shall conform to the requirements specified in Section 2406.

Exit doors shall be marked so that they are readily distinguishable form the adjacent construction.

1004.12 Additional Doors. When additional doors are provided for egress purposes, they shall conform to all provisions of this chapter.

EXCEPTION: Approved revolving doors having leaves which will collapse under opposing pressures may be used in exit situations, provided:
1. Such doors have a minimum width of 6 feet 6 inches (1981 mm).
2. At least one conforming exit door is located adjacent to each revolving door.
3. The revolving door shall not be considered to provide any exit width.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1004, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1005 Section 1005—Corridors and exterior exit balconies.

1005.1 General. This section shall apply to every corridor serving as a required exit for an occupant load of 10 or more except that Section 1005.2 shall apply to all corridors. For the purpose of this section, the term "corridor" shall include exterior exit balconies and covered or enclosed walkways, tunnels and malls. Partitions, rails, counters and similar space dividers not over 5 feet 9 inches (1753 mm) in height above the floor shall not be construed to form corridors.

Exit corridors shall not be interrupted by intervening rooms.

EXCEPTION: Foyers, lobbies or reception rooms constructed as required for corridors shall not be construed as intervening rooms.

Corridors which are located within an accessible route of travel shall also comply with Chapter 11.

For Group I Occupancies see Section 1019.3.

1005.2 Width. The minimum corridor width shall be determined as specified in Section 1003.2, but shall not be less than 44 inches (1118 mm), except as specified herein. Corridors serving an occupant load of 49 or less shall not be less than 36 inches (914 mm) in width. For special requirements for Groups E and I Occupancies, see Sections 1017 and 1019.

1005.3 Height. Corridors and exterior exit balconies shall have a clear height of not less than 7 feet (2134 mm) measured to the lowest projection from the ceiling.

1005.4 Projections. The required width of corridors shall be unobstructed.

EXCEPTION: Handrails and doors, when fully opened, shall not reduce the required width by more than 7 inches (178 mm). Doors in any position shall not reduce the required width by more than one half. Other nonstructural projections such as trim and similar decorative features may project into the required width 1 1/2 inches (38 mm) on each side.

1005.5 Access to Exits. When more than one exit is required, they shall be so arranged that it is possible to go in either direction from any point in a corridor to a separate exit, except for dead ends not exceeding 20 feet (6096 mm) in length.

1005.6 Changes in Elevation. When a corridor or exterior exit balcony is accessible to the handicapped, changes in elevation of the floor shall be made by means of a ramp, except as provided for doors by Section 1004.9.

1005.7 Construction. Walls of corridors serving a Group R, Division 1 or Group I Occupancy having an occupant load of 10 or more and walls of corridors serving other occupancies having an occupant load of 30 or more shall be of not less than one-hour fire-resistive construction and the ceilings shall not be less than that required for a one-hour fire-resistive floor or roof system.

EXCEPTIONS: 1. One-story buildings housing Group S, Division 2 Occupancies.
2. Corridors more than 30 feet (9144 mm) in width where occupancies served by such corridors have at least one exit independent from the corridor. (See Chapter 4 for covered malls.)
3. Exterior sides of exterior exit balconies.
4. In Group I, Division 3 Occupancies such as jails, prisons, reformatories and similar buildings with open-barred cells forming corridor walls, the corridors and cell doors need not be fire resistive.
5. Corridor walls and ceilings need not be of fire-resistive construction within office spaces having an occupant load of 100 or less when the entire story in which the space is located is equipped with an automatic sprinkler system throughout and an automatic smoke-detection system installed within the corridor. The actuation of any detector shall activate alarms audible in all areas served by the corridor.
6. In other than Type I or II construction, exterior exit balcony roof assemblies may be of heavy-timber construction without concealed spaces.
7. Within office spaces occupied by a single tenant, partial height partitions which form corridors and which do not exceed 6 feet (1829 mm) in height need not be fire resistive, provided they are constructed in accordance with Section 601.5 and are not more than three fourths of the floor-to-ceiling height.
8. Corridor walls and ceilings need not be of fire-resistive construction within office spaces having an occupant load

of 100 or less when the building in which the space is located is equipped with an automatic sprinkler system throughout.

When the ceiling of the entire story is an element of a one-hour fire-resistive floor or roof system, the corridor walls may terminate at the ceiling. When the room-side fire-resistive membrane of the corridor wall is carried through to the underside of a fire-resistive floor or roof above, the corridor side of the ceiling may be protected by the use of ceiling materials as required for one-hour floor or roof system construction or the corridor ceiling may be of the same construction as the corridor walls.

Ceilings of noncombustible construction may be suspended below the fire-resistive ceiling.

For wall and ceiling finish requirements, see Table 8-B.

For restrictions on the use of corridors to convey air, see Chapter 10 of the Mechanical Code.

1005.8 Openings.

1005.8.1 Doors. When corridor walls are required to be of one-hour fire-resistive construction by Section 1005.7, every interior door opening shall be protected by a tight-fitting smoke- and draft-control assembly having a fire-protection rating of not less than 20 minutes when tested in accordance with U.B.C. Standard 7-2. Said doors shall not have louvers. The door and frame shall bear an approved label or other identification showing the rating thereof, the name of the manufacturer and the identification of the service conducting the inspection of materials and workmanship at the factory during fabrication and assembly. Doors shall be maintained self-closing or shall be automatic closing by actuation of a smoke detector in accordance with Section 713.2. Smoke- and draft-control door assemblies shall be provided with a gasket so installed as to provide a seal where the door meets the stop on both sides and across the top.

EXCEPTIONS:
1. Viewports may be installed if they require a hole not larger than 1 inch (25 mm) in diameter through the door, have at least a 1/4-inch-thick (6.4 mm) glass disc and the holder is of metal which will not melt out when subject to temperatures of 1,700°F. (927°C.).
2. Protection of openings in the interior walls of exterior exit balconies is not required when it is possible to exit in two directions.

1005.8.2 Openings other than doors. Where corridor walls are required to be of one-hour fire-resistive construction by Section 1005.7, interior openings for other than doors or ducts shall be protected by fixed glazing listed and labeled for a fire-protection rating of at least three-fourths hour in accordance with Section 713.9. The total area of all openings, other than doors, in any portion of an interior corridor shall not exceed 25 percent of the area of the corridor wall of the room which it is separating from the corridor. For duct openings, see Sections 713.10 and 713.11.

EXCEPTION: Protection of openings in the interior walls of exterior exit balconies is not required when it is possible to exit in two directions.

1005.9 Location on Property. Exterior exit balconies shall not be located in areas where openings are not permitted or where openings are required to be protected due to location on the property.

1005.10 Elevators. Elevators opening into a corridor serving a Group R, Division 1 or Group I Occupancy having an occupant load of 10 or more, or a corridor serving other occupancies having a occupant load of 30 or more shall be provided with an elevator lobby at each floor containing such a corridor. The lobby shall completely separate the elevators for the corridor by construction conforming to Section 1005.7 and all openings into the lobby wall contiguous with the corridor shall be protected as required by Section 1005.8.

EXCEPTIONS:
1. In office buildings classed as Group B Occupancies, separations need not be provided from a street floor lobby, provided the entire street floor is protected with an automatic sprinkler system.
2. Elevators not required to meet the shaft enclosure requirements of Section 711.
3. When additional doors are provided in accordance with Section 3007.
4. Where elevator shafts are pressurized in accordance with Section 905, elevator lobbies need not be provided.

Elevator lobbies shall comply with Section 3002.

In fully sprinklered office buildings, corridors may lead through enclosed elevator lobbies if all areas of the building have access to at least one required exit without passing through the elevator lobby.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1005, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1006 Section 1006—Stairways.

1006.1 General. Every stairway having two or more risers serving any building or portion thereof shall conform to the requirements of this section. When aisles in assembly rooms have steps, they shall conform with provisions in Section 1014.

EXCEPTIONS:
1. Stairs or ladders used only to attend equipment or window wells are exempt from the requirements of this section.
2. Stairs or ladders within an individual dwelling unit used to gain access to areas of 200 square feet (18.6 m²) or less, and not containing the primary bathroom or kitchen, are exempt from the requirements of this section.

Stairways located in a building required to be accessible shall also comply with Chapter 11.

1006.2 Width. The minimum stairway width shall be determined as specified in Section 1003.2, but shall not be less than 44 inches (1118 mm) except as specified herein and in Chapter 11. Stairways serving an occupant load of 49 or less shall not be less than 36 inches (914 mm) in width.

Handrails may project into the required width a distance of 3 1/2 inches (89 mm) from each side of a stairway. Stringers and other projections such as trim and similar decorative features may project into the required width 1 1/2 inches (38 mm) on each side.

1006.3 Rise and Run. The rise of steps shall not be less than 4 inches (102 mm) or greater than 7 1/2 inches (190 mm). Except as permitted in Sections 1006.4 and 1006.6, the run shall not be less than 10 inches (254 mm), as measured horizontally between the vertical planes of the furthermost projections of adjacent treads. Except as

permitted in Sections 1006.4, 1006.5 and 1006.6, the largest tread run within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

EXCEPTIONS: 1. Private steps and stairways serving an occupant load of less than 10 and stairways to unoccupied roofs may be constructed with an 8-inch-maximum (203 mm) rise and a 9-inch-minimum (229 mm) run.
2. Where the bottom or top riser adjoins a sloping public way, walk or driveway having an established grade and serving as a landing, the bottom or top riser may be reduced along the slope.

Where Exception 2 to Section 1103.2.2 is used in a building design, the run of stair treads shall not be less than 11 inches (279 mm), as measured horizontally between the vertical planes of the furthermost projections of adjacent tread. The largest tread within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

1006.4 Winding Stairways. In Group R, Division 3 Occupancies and in private stairways in Group R, Division 1 Occupancies, winders may be used if the required width of run is provided at a point not more than 12 inches (305 mm) from the side of the stairway where the treads are narrower, but in no case shall any width of run be less than 6 inches (152 mm) at any point.

1006.5 Circular Stairways. Circular stairways may be used as an exit, provided the minimum width of run is not less than 10 inches (254 mm) and the smaller radius is not less than twice the width of the stairway. The largest tread width or riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

1006.6 Spiral Stairways. In Group R, Division 3 Occupancies and in private stairways within individual units of Group R, Division 1 Occupancies, spiral stairways may be installed. Such stairways may be used for required exits when the area served is limited to 400 square feet (37.16 m^2).

The tread must provide a clear walking area measuring at least 26 inches (660 mm) from the outer edge of the supporting column to the inner edge of the handrail. A run of at least 7 1/2 inches (191 mm) is to be provided at a point 12 inches (305 mm) from where the tread is the narrowest. The rise must be sufficient to provide 6-foot 6-inch (1981 mm) headroom. The rise shall not exceed 9 1/2 inches (241 mm).

1006.7 Landings. Stairways shall have landings at the top and bottom. Every landing shall have a dimension measured in the direction of travel not less than the width of the stairway. Such dimension need not exceed 44 inches (1118 mm) when the stair has a straight run. There shall not be more than 12 feet (3658 mm) vertically between landings. For landings with adjoining doors, see Section 1004.10.

EXCEPTION: Stairs serving an unoccupied roof are exempt from these provisions.

1006.8 Basement Stairways. When a basement stairway and a stairway to an upper story terminate in the same exit enclosure, an approved barrier shall be provided to prevent persons from continuing on into the basement. Directional exit signs shall be provided as specified in Section 1013.

1006.9 Handrails. Stairways shall have handrails on each side, and every stairway required to be more than 88 inches (2235 mm) in width shall be provided with not less than one intermediate handrail for each 88 inches (2235 mm) of required width. Intermediate handrails shall be spaced approximately equally across the entire width of the stairway.

EXCEPTIONS: 1. Stairways less than 44 inches (1118 mm) in width or stairways serving one individual dwelling unit in Group R, Division 1 or 3 Occupancies or a Group R, Division 3 congregate residence may have one handrail. This exception shall not be used concurrently with the second exception to the first paragraph of Section 1103.2.2.
2. Private stairways 30 inches (762 mm) or less in height may have handrails on one side only. This exception shall not be used concurrently with the second exception to the first paragraph of Section 1103.2.2.
3. Stairways having less than four risers and serving one individual dwelling unit in Group R, Division 1 or 3, or a Group R, Division 3 congregate residence or serving Group U Occupancies need not have handrails.

The top of handrails and handrail extensions shall be placed not less than 34 inches (864 mm) or more than 38 inches (965 mm) above the nosing of treads and landings. Handrails shall be continuous the full length of the stairs and, except for private stairways, at least one handrail shall extend in the direction of the stair run not less than 12 inches (305 mm) beyond the top riser nor less than a length equal to one tread depth plus 12 inches (305 mm) beyond the bottom riser. Ends shall be returned or shall terminate in newel posts or safety terminals.

The handgrip portion of handrails shall not be less than 1 1/4 (32 mm) inches nor more than 2 inches (51 mm) in cross-sectional dimension or the shape shall provide an equivalent gripping surface. The handgrip portion of handrails shall have a smooth surface with no sharp corners.

Handrails projecting from a wall shall have a space of not less than 1 1/2 inches (38 mm) between the wall and the handrail.

1006.10 Guardrails. Stairways open on one or both sides shall have guardrails as required by Section 1001.5.

1006.11 Protection of Exterior Wall Openings. Except in Group R, Division 3 Occupancies, all openings in the exterior wall below and within 10 feet (3048 mm), measured horizontally, of an exterior exit stairway or unprotected openings in an interior exit stairway serving a building over two stories in height or a floor level having such openings in two or more floors below shall be protected by fixed, self-closing, or automatic-closing fire assemblies having a three-fourths-hour fire-protection rating.

EXCEPTIONS: 1. Openings may be unprotected when two separated exterior stairways serve an exterior exit balcony.
2. Protection of openings is not required for open parking garages conforming to Section 405.

1006.12 Interior Stairway Construction. Interior stairways shall be constructed as specified in Sections 602.4, 603.4, 604.4, 605.4 and 606.4.

Except when enclosed usable space under stairs is prohibited by Section 1009.6, the walls and soffits of the enclosed space shall be protected on the enclosed side as required for one-hour fire-resistive construction.

All required interior stairways which extend to the top floor in any building four or more stories in height shall have, at the highest point of the stair shaft, an approved hatch openable to the exterior not less than 16 square feet (1.5 m^2) in area with a minimum dimension of 2 feet (610 mm).

EXCEPTION: The hatch need not be provided on pressurized enclosures or on stairways that extend to the roof with an opening onto that roof.

Stairways exiting directly to the exterior of a building four or more stories in height shall be provided with means for emergency entry for fire department access.

1006.13 Exterior Stairway Construction. Exterior stairways shall be constructed as specified in Sections 602.4, 603.4, 604.4, 605.4 and 606.4.

Exterior stairways shall not project into yards where openings are not permitted or protection of openings is required.

Enclosed usable space under stairs shall have the walls and soffits protected on the enclosed side as required for one-hour fire-resistive construction.

Stairways exiting directly to the exterior of a building four or more stories in height shall be provided with means for emergency entry for fire department access.

1006.14 Stairway to Roof. In buildings four or more stories in height, one stairway shall extend to the roof surface, unless the roof has a slope greater than 4 in 12. See Section 1006.12 for roof hatch requirements.

1006.15 Headroom. Every stairway shall have a headroom clearance of not less than 6 feet 8 inches (2032 mm). Such clearances shall be measured vertically from a plane parallel and tangent to the stairway tread nosings to the soffit above at all points.

1006.16 Stairway Identification. Approved stairway identification signs shall be located at each floor level in all enclosed stairways in buildings four or more stories in height. The sign shall identify the stairway, indicate whether there is roof access, the floor level, and the upper and lower terminus of the stairway. The sign shall be located approximately 5 feet (1524 mm) above the floor landing in a position which is readily visible when the door is in the open or closed position. Signs shall comply with requirements of U.B.C. Standard 10-2. Each door to a floor level also shall have a tactile sign, including raised letters and Braille, identifying the floor level and shall comply with Part IV of Chapter 11.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1006, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1007 Section 1007—Ramps.

1007.1 General. Except for ramped aisles in assembly rooms, ramps used as exits shall conform to the provisions of this section. Ramped aisles within assembly rooms shall conform with the provisions in Section 1014. Ramps which are located within an accessible route of travel shall also comply with Chapter 11.

1007.2 Width. The width of ramps shall be determined as specified in Section 1003.2, but shall not be less than 44 inches (1118 mm), except as specified herein. Ramps serving an occupant load of 49 or less shall not be less than 36 inches (914 mm) in width.

Handrails may project into the required width a distance of 3 1/2 inches (89 mm) from each side of a ramp. Other projections, such as trim and similar decorative features, may project into the required width 1 1/2 inches (38 mm) on each side.

1007.3 Slope. The slope of ramps required by Chapter 11 which are located within an accessible route of travel shall not be steeper than 1 unit vertical in 12 units horizontal (8% slope). The slope of other ramps shall not be steeper than 1 unit vertical in 8 units horizontal (12.5% slope).

1007.4 Landings. Ramps having slopes steeper than 1 unit vertical in 15 units horizontal (6.7% slope) shall have landings at the top and bottom, and at least one intermediate landing shall be provided for each 5 feet (1524 mm) of rise. Top landings and intermediate landings shall have a dimension measured in the direction of ramp run of not less than 5 feet (1524 mm). Landings at the bottom of ramps shall have a dimension in the direction of ramp run of not less than 6 feet (1829 mm). Landings shall provide maneuvering clearances at doors as required in Chapter 11.

EXCEPTION: Ramps with slopes no steeper than 1 unit vertical in 12 units horizontal (8% slope) may have landings at the bottom in the direction of ramp run not less than 5 feet (1524 mm) in length.

1007.5 Handrails. Ramps having slopes steeper than 1 unit vertical in 20 units horizontal (5.0% slope) shall have handrails as required for stairways, except that intermediate handrails shall not be required. At least one handrail shall extend in the direction of ramp run not less than 12 inches (305 mm) horizontally beyond the top and bottom of the ramp runs. Ramped aisles need not have handrails on sides serving fixed seating.

1007.6 Construction. Ramps shall be constructed as required for stairways.

1007.7 Surface. The surface of ramps shall be roughened or shall be of slip-resistant materials.

1007.8 Guardrails. Ramps open on one or both sides shall have guardrails as required by Section 509.

1007.9 Headroom. Ramps shall have a headroom clearance of not less than 7 feet (2134 mm). Such clearances shall be measured vertically from the finished floor surface of the ramp and landings to the soffit above at all points.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1007, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1009 Section 1009—Stairway, Ramp and Escalator Enclosures.

1009.1 General. Interior stairways, ramps or escalators shall be enclosed as specified in this section.

EXCEPTIONS: 1. In other than Groups H and I Occupancies, an enclosure need not be provided for a stairway, ramp or escalator serving only one adjacent floor. Any two such interconnected floors shall not be open to other floors. For enclosure of escalators serving Group B Occupancies, see Section 304.6.
2. Stairs in Group R, Division 3 Occupancies and stairs within individual dwelling units in Group R, Division 1 Occupancies need not be enclosed.
3. Stairs in open parking garages, as defined in Section 311.9, need not be enclosed.

1009.2 Enclosure Construction. Enclosure walls shall not be of less than two-hour fire-resistive construction in buildings four or more stories in height or of Types I and II fire-resistive construction and shall not be of less than one-hour fire-resistive construction elsewhere.

EXCEPTION: In sprinkler-protected parking garages restricted to the storage of private or pleasure-type motor vehicles, stairway enclosures may be enclosed with glazing meeting the requirements of Sections 713.7, 713.8 and 713.9.

1009.3 Openings into Enclosures. Openings into exit enclosures other than permitted exterior openings shall be limited to those necessary for exiting from a normally occupied space into the enclosure and exiting from the enclosure. Other penetrations into and opening through the exit enclosure are prohibited except for ductwork and equipment necessary for independent stair pressurization, sprinkler piping, standpipes and electrical conduit serving the stairway and terminating in a listed box not exceeding 16 square inches (10 323 mm²) in area. Penetrations and communicating openings between adjacent exit enclosures are not permitted regardless of whether the opening is protected.

All exit doors in an exit enclosure shall be protected by a fire assembly having a fire-protection rating of not less than one hour where one-hour enclosure construction is permitted in Section 1009.2 and one and one-half hours where two-hour enclosure construction is required by Section 1009.2. Doors shall be maintained self-closing or shall be automatic closing by actuation of a smoke detector as provided for in Section 713.2. The maximum transmitted temperature end point shall not exceed 450°F. (232°C.) above ambient at the end of 30 minutes of the fire exposure specified in U.B.C. Standard 7-2.

1009.4 Extent of Enclosure. Stairway and ramp enclosures shall include landings and parts of floors connecting stairway flights and shall also include a corridor or exit passageway on the ground floor leading from the stairway to the exterior of the building. Openings into the corridor or exit passageway shall comply with the requirements of Section 1009.3.

EXCEPTIONS: 1. Enclosed corridors or exit passageways are not required from unenclosed stairways or ramps.
2. In office buildings, a maximum of 50 percent of the exits may discharge through a street-floor lobby, provided the required exit width is free and unobstructed and the entire street floor is protected with an automatic sprinkler system.

1009.5 Barrier. A stairway in an exit enclosure shall not continue below the grade level exit unless an approved barrier is provided at the ground-floor level to prevent persons from accidentally continuing into the basement.

1009.6 Use of Space under Stair and Ramp. There shall be no enclosed usable space under stairways or ramps in an exit enclosure, nor shall the open space under such stairways be used for any purpose.

1009.7 Pressurized Enclosure. In a building having a floor used for human occupancy which is located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, the entire required enclosure shall be pressurized in accordance with Section 905 of this code and this section. Pressurization shall occur automatically upon activation of an approved fire alarm system.

EXCEPTION: When the building is not equipped with a fire alarm system, pressurization shall be upon activation of a spot-type smoke detector listed for releasing service installed within 5 feet (1524 mm) of each vestibule entry.

The upper portion of such enclosures shall be provided with controlled relief vent capable of discharging a minimum of 2,500 cubic feet per minute (1180 L/s) of air at the design pressure difference.

Such enclosures shall be provided with a pressurized entrance vestibule.

1009.8 Vestibules. When required by Section 1009.7, vestibules shall meet the following requirements:

1. Where a wheelchair space is provided, such space shall not obstruct the required exit width and shall not interfere with access to or use of fire department hose connections and valves.

2. Emergency illumination shall be provided to maintain a minimum of 30 footcandles (323 lx) on the floor.

3. Fire department connections and valves serving the floor shall be located within the vestibule and in such a manner as to not obstruct exiting when hose lines are connected and charged.

4. The minimum pressure differences within the vestibule with the doors closed shall be 0.05 inch water gage (12.44 Pa) positive pressure relative to the fire floor and 0.05 inches water gage (12.44 Pa) negative relative to the exit enclosure. No pressure difference is required relative to a nonfire floor.

For areas of refuge, see Section 1104.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1009, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1014 Section 1014—Aisles.

1014.1 General. Aisles leading to required exits shall be provided from all portions of buildings. Aisles located within an accessible route of travel shall also comply with Chapter 11.

1014.2 Width in Occupancies without Fixed Seats. The width of aisles in occupancies without fixed seats shall comply with this section. Aisle widths shall be provided in accordance with the following:

1. In areas serving employees only, the minimum aisle width shall be 24 inches (610 mm) but not less than the width required by the number of employees served.

2. In public areas of Groups B and M Occupancies, and in assembly occupancies without fixed seats, the minimum clear aisle width shall be 36 inches (914 mm) where tables, counters, furnishings, merchandise or other similar obstructions are placed on one side of the aisle only and 44 inches (1118 mm) when such obstructions are placed on both sides of the aisle.

1014.3 Width in Assembly Occupancies with Fixed Seats. Aisles in assembly occupancies with fixed seats shall comply with this section. The clear width of aisles shall be based on the number of occupants within the portion of the seating areas served by the aisle.

The clear width of an aisle in inches shall not be less than the occupant load served by the aisle multiplied by 0.3 for aisles with slopes greater than 1 unit vertical to 8 units horizontal (12.5% slope) and not less than 0.2 for aisles with a slope of 1 unit vertical to 8 units horizontal (12.5% slope) or less. In addition, when the rise of steps in aisles exceeds 7 inches (178 mm), the aisle clear width shall be increased by 1 1/4 inches (32 mm) for each 100 occupants or fraction thereof served for each 1/4 inch (6.35 mm) of riser height above 7 inches (178 mm).

EXCEPTION: For buildings with smoke-protected assembly seating and for which an approved life-safety evaluation is conducted, the minimum clear width of aisles and other means of egress may be in accordance with Table 10-C. For Table 10-C, the number of seats specified must be within a single assembly area, and interpolation shall be permitted between the specified values shown. If Table 10-C is used the minimum clear widths shown shall be modified in accordance with the following:

1. If risers exceed 7 inches (178 mm) in height, multiply the stair width in the tables by factor A, where

$$A = 1 + \frac{(\text{riser height} - 7.0 \text{ in.})}{5}$$

For SI:

$$A = 1 + \frac{(\text{riser height} - 178 \text{ mm})}{127}$$

2. Stairs not having a handrail within a 30-inch (760 mm) horizontal distance shall be 25 percent wider than otherwise calculated, i.e., multiply by $B = 1.25$

3. Ramps steeper than 1 in 10 slope where used in ascent shall have their width increased by 10 percent, i.e., multiply factor $C = 1.10$.

Where exiting is possible in two directions, the width of such aisles shall be uniform throughout their length.

When aisles converge to form a single path of exit travel, the aisle width shall not be less than the combined required width of the converging aisles.

In assembly rooms with fixed seats arranged in rows, the clear width of aisles shall not be less than set forth above or less than the following:

Forty-eight inches (1219 mm) for stairs having seating on both sides.

Thirty-six inches (914 mm) for stairs having seating on one side.

Twenty-three inches (584 mm) between a stair handrail and seating when the aisles are subdivided by the handrail.

Forty-two inches (1067 mm) for level or ramped aisles having seating on both sides.

Thirty-six inches (914 mm) for level or ramped aisles having seating on one side.

Twenty-three inches (584 mm) between a stair handrail and seating when an aisle does not serve more than five rows on one side.

1014.4 Aisle Termination. Aisles shall terminate at a cross aisle, foyer, doorway or vomitory. Aisles shall not have a dead end greater than 20 feet (6096 mm) in length.

EXCEPTION: A longer dead-end aisle is permitted when seats served by the dead-end aisle are not more than 24 seats from another aisle measured along a row of seats having a minimum clear width of 12 inches (305 mm) plus 0.6 inches (15 mm) for each additional seat above seven in a row.

Each end of a cross aisle shall terminate at an aisle, foyer, doorway or vomitory.

1014.5 Ramp Slope. The slope of ramped aisles shall not be more than 1 unit vertical in 8 units horizontal (12.5% slope). Ramped aisles shall have a slip-resistant surface.

EXCEPTION: When provided with fixed seating, theaters may have a slope not steeper than 1 unit vertical in 5 units horizontal (20% slope).

1014.6 Aisle Steps.

1014.6.1 When prohibited. Steps shall not be used in aisles having a slope of 1 unit in 8 units horizontal (12.5% slope) or less.

1014.6.2 When required. Aisles with a slope steeper than 1 unit vertical in 8 units horizontal (12.5% slope) shall consist of a series of risers and treads extending across the entire width of the aisle, except as provided in Section 1014.5.

The height of risers shall not be more than 7 inches (178 mm) or less than 4 inches (102 mm) and the tread run shall not be less than 11 inches (279 mm). The riser height shall be uniform within each flight and the tread run shall be uniform throughout the aisle. Variations in run or height between adjacent treads or risers shall not exceed 3/16 inch (4.8 mm). A contrasting marking stripe or other approved marking shall be provided on each tread at the nosing or leading edge such that the location of each tread is readily apparent when viewed in descent. Such stripe shall be a minimum of 1 inch (25 mm) wide and a maximum of 2 inches (51 mm) wide.

EXCEPTION: When the slope of aisle steps and the adjoining seating area is the same, the riser heights may be increased to a maximum of 9 inches (229 mm) and may be nonuniform but only to the extent necessitated by changes in the slope of the adjoining seating area to maintain adequate sightlines. Variations may exceed 3/16 inch (4.8 mm) between adjacent risers provided the exact location of such variations is identified with a marking stripe in each tread at the nosing or leading edge adjacent to the nonuniform riser. The marking stripe shall be distinctively different from the contrasting marking stripe.

1014.7 Handrails. Handrails shall comply with the height, size and shape dimensions set forth in Section 1006.9 and shall have rounded terminations or bends. Ramped aisles having a slope steeper than 1 unit vertical in 15 units

horizontal (6.7% slope) and aisle stairs (two or more adjacent steps) shall have handrails located either at the side or within the aisle width. Handrails may project into the required aisle width a distance of 3 1/2 inches (89 mm).

EXCEPTIONS: 1. Handrails may be omitted on ramped aisles having a slope not greater than 1 unit vertical in 8 units horizontal (12.5% slope) when fixed seating is on both sides of the aisle.
2. Handrails may be omitted when a guardrail is at the side of an aisle which conforms to the size and shape requirements for handrails.

Handrails located within the aisle width shall be discontinuous with gaps or breaks at intervals not to exceed five rows. These gaps or breaks shall have a clear width of not less than 22 inches (559 mm) or more than 36 inches (914 mm) measured horizontally. Such handrails shall have an additional intermediate handrail located 12 inches (305 mm) below the main handrail.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1014, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1019 Group I Occupancies.

1019.1 Exterior Doors. All required exterior exit doors shall open in the direction of exit travel.

1019.2 Minimum Size of Exits. The clear width of exits serving areas occupied or used by bed or litter patients shall be such that it will allow ready passage of such equipment, but shall not be less than 44 inches (1118 mm). Other exits shall have a clear width of not less than 32 inches (813 mm). There shall be no projections into the clear width.

1019.3 Corridors. The minimum clear width of a corridor shall be determined as specified in Section 1003.2, but shall not be less than 44 inches (1118 mm), except that corridors serving any area housing one or more nonambulatory persons shall not be less than 8 feet (2438 mm) in width.

EXCEPTION: Corridors serving surgical areas of Group I, Division 1.2 Occupancies shall not be less than six feet (1829 mm) in width until reaching an exterior door, enclosed exit stairway or horizontal exit and shall not pass through an adjoining room.

Any change in elevation of the floor in a corridor serving nonambulatory persons shall be made by means of a ramp.

Corridors shall comply with Section 1005 except that in hospitals and nursing homes classified as Group I, Division 1.1 Occupancies the following exceptions apply:

1. Nurses' stations including space for doctors' and nurses' charting and communications constructed as required for corridors need not be separated from corridors.

2. Waiting areas and similar spaces constructed as required for corridors need not be separated from corridors, provided:

2.1 Each space is located to permit direct visual supervision by the facility staff, and

2.2 The space and corridors into which the space opens are in the same smoke compartment and the space is protected by an approved electrically supervised automatic smoke-detection system.

3. Door closers need not be installed on doors to sleeping rooms.

4. Fixed fully tempered or laminated glass in wood or metal frames may be used in corridor walls, provided the glazed area does not exceed 25 percent of the area of the corridor wall of the room.

5. The total area of glass in corridor walls is not limited when the glazing is fixed 1/4-inch-thick (6.4 mm) wired glass in steel frames and the size of individual glazed panel does not exceed 1,296 square inches (0.836 m^2).

1019.4 Basement Exits. One exit accessible to every room below grade shall lead directly to the exterior at grade level.

1019.5 Ramps. Group I, Division 1.1 and 1.2 Occupancies housing nonambulatory patients shall have access to a ramp leading from the first story to the exterior of the building at the ground floor level.

1019.6 Hardware. Exit doors serving an area having an occupant load of 50 or more shall not be provided with a latch or lock unless it is panic hardware. Patient room doors shall be readily openable from either side without the use of keys.

EXCEPTIONS: 1. In Group I, Division 1.1 hospitals and nursing homes, locking devices, when approved, may be installed on patient sleeping rooms, provided such devices are readily openable from the patient room side and are readily operable by the facility staff on the other side. When key locks are used on patient room doors, keys shall be located on the floor involved at a prominent location accessible to the staff.
2. In Group I, Division 3 Occupancies, approved locks or safety devices may be used where it is necessary to forcibly restrain personal liberties of inmates or patients.

1019.7 Suites.

1019.7.1 General. A group of rooms in a Group I, Division 1.1, Division 1.2 or Division 2 Occupancy may be considered a suite when it complies with the following:

1. Size. Suites of rooms, other than patient sleeping rooms, shall not exceed 10,000 square feet (928.5 m^2) in area. Suites of patient sleeping rooms shall not exceed 5,000 square feet (465 m^2) in area.

2. Occupancy separation. Each suite shall be separated from the rest of the building by at least a one-hour fire-resistive occupancy separation.

3. Visual supervision. Each patient sleeping room in the suite shall be located to permit direct and constant visual supervision by the facility staff.

4. Other exits. Exiting for portions of the building outside of a suite shall not require passage through the suite.

1019.7.2 Corridors. One-hour fire-resistive corridor construction is not required within a suite.

1019.7.3 Exits through adjoining rooms. Rooms within suites may have exits through one adjoining room if there is not more than 100 feet (30 480 mm) of travel distance within the suite to an exit corridor, exterior exit door, horizontal exit, exit passageway or enclosed stairway. Rooms other than patient sleeping rooms may have exits through two adjoining rooms where there is not more than

50 feet (15 240 mm) of travel distance within the suite to an exit corridor, exterior exit door, horizontal exit, exit passageway or enclosed stairway.

1019.7.4 Number of exits. Suites shall be provided with exits as required by Table 10-A.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1019, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1030 Table 10-A—Minimum egress requirements.

TABLE 10-A—MINIMUM EGRESS REQUIREMENTS[1]

USE[2]	MINIMUM OF TWO EXITS OTHER THAN ELEVATORS ARE REQUIRED WHERE NUMBER OF OCCUPANTS IS AT LEAST	OCCUPANT LOAD FACTOR[3] (square feet) × 0.0929 for m^2
1. Aircraft hangars (no repair)	10	500
2. Auction rooms	30	7
3. Assembly areas, concentrated use (without fixed seats) Auditoriums Churches and chapels Dance floors Lobby accessory to assembly occupancy Lodge rooms Reviewing stands Stadiums	50	7
Waiting area	50	3
4. Assembly areas, less-concentrated use Conference rooms Dining rooms Drinking establishments Exhibit rooms Gymnasiums Lounges Stages	50	15
5. Bowling alley (assume no occupant load for bowling lanes)	50	4
6. Children's homes and homes for the aged	6	80
7. Classrooms	50	20
8. Congregate residences	10	200
9. Courtrooms	50	40
10. Dormitories	10	50
11. Dwellings	10	300
12. Exercising rooms	50	50
13. Garage, parking	30	200
14. Hospitals and sanitariums— Health-care center Nursing homes Sleeping rooms Treatment rooms	10 6 10	80 80 80
15. Hotels and apartments	10	200
16. Kitchen—commercial	30	200
17. Library reading room	50	50
18. Locker rooms	30	50

(Continued)

TABLE 10-A—MINIMUM EGRESS REQUIREMENTS[1]—(Continued)

USE[2]	MINIMUM OF TWO EXITS OTHER THAN ELEVATORS ARE REQUIRED WHERE NUMBER OF OCCUPANTS IS AT LEAST	OCCUPANT LOAD FACTOR[3] (square feet) × 0.0929 for m^2
19. Malls (see Chapter 4)	—	—
20. Manufacturing areas	30	200
21. Mechanical equipment room	30	300
22. Nurseries for children (day care)	7	35
23. Offices	30	100
24. School shops and vocational rooms	50	50
25. Skating rinks	50	50 on the skating area; 15 on the deck
26. Storage and stock rooms	30	300
27. Stores—retail sales rooms		
Basements and ground floor	50	30
Upper floors	50	60
28. Swimming pools	50	50 for the pool area; 15 on the deck
29. Warehouses	30	500
30. All others	50	100

[1]Access to, and egress from, buildings for persons with disabilities shall be provided as specified in Chapter 11.
[2]For additional provisions on number of exits from Groups H and I Occupancies and from rooms containing fuel-fired equipment or cellulose nitrate, see Sections 1018, 1019 and 1020, respectively.
[3]This table shall not be used to determine working space requirements per person.
[4]Occupant load based on five persons for each alley, including 15 feet (4572 mm) of runway.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1030, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1100 Chapter 11—Accessibility.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1100, filed 12/21/94, effective 6/30/95.]

PART I - GENERAL

WAC 51-30-1101 Section 1101—Scope.

Section 1101.1 General. Buildings or portions of buildings shall be accessible to persons with disabilities as required by this chapter.

Chapter 11 has been amended to comply with the Federal Fair Housing Act (FFHA) Guidelines as published by the U.S. Department of Housing and Urban Development (March 1991) and the Americans With Disabilities Act (ADA) Guidelines as published by the U.S. Architectural and Transportation Barriers Compliance Board and Department of Justice (July 1991).

Reference is made to Appendix Chapter 11 for FFHA and ADA requirements not regulated by this chapter. See Section 101.3.

1101.2 Design. The design and construction of accessible building elements shall be in accordance with this chapter. For a building, structure or building element to be considered to be accessible, it shall be designed and constructed to the minimum provisions of this chapter.

1101.3 Maintenance of Facilities. Any building, facility, dwelling unit, or site which is constructed or altered to be accessible or adaptable under this chapter shall be maintained accessible and/or adaptable during its occupancy.

1101.4 Alternate Methods. The application of Section 104.2.8 to this chapter shall be limited to the extent that alternate methods of construction, designs, or technologies shall provide substantially equivalent or greater accessibility.

1101.5 Modifications. Where full compliance with this chapter is impractical due to unique characteristics of the terrain, the building official may grant modifications in accordance with Section 104.2.7, provided that any portion of the building or structure that can be made accessible shall be made accessible to the greatest extent practical.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1101, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1102 Section 1102—Definitions.

Section 1102. For the purpose of this chapter certain terms are defined as follows:

ACCESSIBLE is approachable and usable by persons with disabilities.

ACCESS AISLE is an accessible pedestrian space between elements, such as parking spaces, seating, and desks, that provides clearances appropriate for use of the elements.

ACCESSIBLE EXIT is an exit, as defined in Section 1101.2, which complies with this chapter and does not contain stairs, steps, or escalators.

ACCESSIBLE ROUTE OF TRAVEL is a continuous unobstructed path connecting all accessible elements and spaces in an accessible building or facility that can be negotiated by a person using a wheelchair and that is usable by persons with other disabilities.

ALTERATION (See Section 1110).

ALTERATION, SUBSTANTIAL (See Section 1110).

AREA FOR EVACUATION ASSISTANCE is an accessible space which is protected from fire and smoke and which facilitates egress.

AUTOMATIC DOOR is a door equipped with a power-operated mechanism and controls that open and close the door automatically upon receipt of a momentary actuating signal. The switch that begins the automatic cycle may be a photoelectric device, floor mat, or manual switch (see also, Power-assisted Door).

CLEAR is unobstructed.

CLEAR FLOOR SPACE is unobstructed floor or ground space (see Section 1106.2).

COMMON USE AREAS are rooms, spaces or elements inside or outside a building that are made available for use by occupants of and visitors to the building.

CROSS SLOPE is the slope that is perpendicular to the direction of travel.

CURB RAMP is a short ramp cutting through or built up to a curb.

DETECTABLE WARNING is a standardized surface feature built in or applied to walking surfaces or other elements to warn visually impaired persons of hazards on a circulation path.

DWELLING UNIT, TYPE A is an accessible dwelling unit that is designed and constructed in accordance with this chapter to provide greater accessibility than a Type B dwelling unit. (Type A dwelling units constructed in accordance with this Chapter also meet the design standards for Type B dwelling units.)

DWELLING UNIT, TYPE B is an accessible dwelling unit that is designed and constructed in accordance with this chapter. (Type B Dwelling Unit Standards are based on the U.S. Department of Housing and Urban Development (HUD) Federal Fair Housing Act Accessibility Guidelines.)

ELEMENT is an architectural or mechanical component of a building, facility, space, or site, such as telephones, curb ramps, doors, drinking fountains, seating, or water closets.

GROUND FLOOR is any occupiable floor less than one story above or below grade with direct access to grade. A building may have more than one ground floor.

LANDING is a level area (except as otherwise provided), within or at the terminus of a stair or ramp.

MARKED CROSSING is a crosswalk or other identified path intended for pedestrian use in crossing a vehicular way.

MULTISTORY DWELLING UNIT is a dwelling unit with finished living space located on one floor, and the floor or floors immediately above or below it.

PATH OF TRAVEL (See Section 1110).

PERSON WITH DISABILITY is an individual who has an impairment, including a mobility, sensory, or cognitive impairment, which results in a functional limitation in access to and use of a building or facility.

POWER-ASSISTED DOOR is a door used for human passage, with a mechanism that helps to open the door, or relieve the opening resistance of a door, upon the activation of a switch or a continued force applied to the door itself.

PRIMARY ENTRANCE is a principal entrance through which most people enter the building. A building may have more than one primary entrance.

PRIMARY ENTRANCE LEVEL is the floor or level of the building on which the primary entrance is located.

PRIMARY FUNCTION is a major function for which the facility is intended.

PUBLIC USE AREAS are those interior or exterior rooms or spaces which are made available to the general public. Public use may be provided at a privately or publicly owned building or facility.

RAMP is any walking surface having a running slope exceeding 1 unit vertical in 48 units horizontal.

SERVICE ENTRANCE is an entrance intended primarily for delivery of goods or services.

SINGLE-STORY DWELLING UNIT is a dwelling unit with all finished living spaces located on one floor.

SITE is a parcel of land bounded by a property line or a designated portion of a public right-of-way.

TACTILE is an object that can be perceived using the sense of touch.

TECHNICALLY INFEASIBLE (See Section 1110).

TEXT TELEPHONE is machinery or equipment that employs interactive graphic (e.g. typed) communications through the transmission of coded signals across the standard telephone network. Text telephones include telecommunications display devices or telecommunications devices for the deaf (TDD's), or computers.

VEHICULAR WAY is a route intended for vehicular traffic, such as a roadway, driveway, or parking lot, located on a site.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1102, filed 12/21/94, effective 6/30/95.]

PART II - NEW CONSTRUCTION

WAC 51-30-1103 Section 1103—Building accessibility.

Section 1103.1 Where required.

1103.1.1 General. Accessibility to temporary or permanent buildings or portions thereof shall be provided for all occupancy classifications except as modified by this chapter. See also Appendix Chapter 11.

EXCEPTIONS: 1. Floors or portions of floors not customarily occupied, including, but not limited to, elevator pits, observation galleries used primarily for security purposes, elevator penthouses, nonoccupiable spaces accessed only by ladders, catwalks, crawl spaces, narrow passageways, or freight elevators, piping and equipment catwalks and machinery, mechanical and electrical equipment rooms.
2. Temporary structures, sites and equipment directly associated with the construction process such as construc-

tion site trailers, scaffolding, bridging, or material hoists are not required to be accessible. This exception does not include walkways or pedestrian protection required by Chapter 30.

1103.1.2 Group A Occupancies.

1103.1.2.1 General. All Group A Occupancies shall be accessible as provided in this chapter.

EXCEPTION: In the assembly areas of dining and drinking establishments or religious facilities which are located in non-elevator buildings; where the area of mezzanine seating is not more than 25 percent of the total seating, an accessible means of vertical access to the mezzanine is not required, provided that the same services are provided in an accessible space which is not restricted to use only by persons with disabilities. Comparable facilities shall be available in all seating areas.

In banquet rooms or spaces where the head table or speaker's lectern is located on a permanent raised platform, the platform shall be accessible in compliance with Section 1106. Open edges on the raised platform shall be protected by a curb with a height of not less than 2 inches (51 mm).

Stadiums, theaters, auditoriums and similar occupancies shall provide wheelchair spaces in accordance with Table No. 11-A.

Wheelchair spaces shall be accessible and shall be located in places with unobstructed sight lines. Wheelchair spaces shall be reasonably distributed throughout the seating plan and located on an accessible route of travel. At least one companion fixed seat shall be provided next to each wheelchair space. Removable seats shall be permitted in the wheelchair spaces.

In addition, one percent, but not less than one, of all fixed seats shall be aisle seats with no armrests, or shall have removable or folding armrests on the aisle side. Each such seat shall be identified by a sign complying with Section 1106.16.1.1.

An accessible route of travel shall connect wheelchair seating locations with performance areas, including stages, arena floors, dressing rooms, locker rooms, and other spaces used by performers.

1103.1.2.2 Assistive listening devices. Assistive listening systems complying with Section 1106.21.2 shall be installed in assembly areas where audible communications are integral to the use of the space including stadiums, theaters, auditoriums, lecture halls, and similar areas; where fixed seats are provided, as follows:

1. Areas with an occupant load of 50 or more.

2. Areas where an audio-amplification system is installed.

Receivers for assistive listening systems shall be provided at a rate of 4 percent of the total number of seats, but in no case fewer than two receivers. In other assembly areas, where permanently installed assistive listening systems are not provided, electrical outlets shall be provided at a rate of not less than 4 percent of the total occupant load.

Signage complying with Section 1106.16.1.3 shall be installed to notify patrons of the availability of the listening system.

1103.1.3 Group B, F, M and S Occupancies. All Group B, F, M and S Occupancies shall be accessible as provided in this chapter. Assembly spaces in Group B, F, M and S Occupancies shall comply with Section 1103.1.2.2.

1103.1.4 Group E Occupancies. All Group E Occupancies shall be accessible as provided in this chapter. Assembly spaces in Group E Occupancies shall comply with Section 1103.1.2.2.

1103.1.5 Group H Occupancies. All Group H Occupancies shall be accessible as provided in this chapter.

1103.1.6 Group I Occupancies. All Group I Occupancies shall be accessible in all public use, common use, and employee use areas, and shall have accessible patient rooms, cells, and treatment or examination rooms as follows:

1. In Group I, Division 1.1 patient care units within hospitals which specialize in treating conditions that affect mobility, all patient rooms in each nursing unit including associated toilet rooms and bathrooms.

2. In Group I, Division 1.1 patient care units within hospitals which do not specialize in treating conditions that affect mobility, at least 1 in every 10 patient rooms in each nursing unit, including associated toilet rooms and bathrooms.

3. In Group I, Division 1.1 and Division 2 nursing homes and long-term care facilities, at least 1 in every 2 patient rooms, including associated toilet rooms and bathrooms.

4. In Group I, Division 3 mental health occupancies, at least 1 in every 10 patient rooms, including associated toilet rooms and bathrooms.

5. In Group I, Division 3 jail, prison and similar occupancies, at least 1 in every 100 rooms or cells, including associated toilet rooms and bathrooms.

6. In Group I Occupancies, all treatment and examination rooms shall be accessible.

In Group I Division 1.1 and 2 Occupancies, at least one accessible entrance that complies with Section 1103.2 shall be under shelter. Every such entrance shall include a passenger loading zone which complies with Section 1108.2.

1103.1.7 Group U Occupancies. Group U, Division 1 Occupancies shall be accessible as follows:

1. Private garages and carports which contain accessible parking serving Type A dwelling units, accessible hotel and lodging rooms and congregate residences.

2. In Group U, Division 1 agricultural buildings, access need only be provided to paved work areas and areas open to the general public.

1103.1.8 Group R Occupancies.

1103.1.8.1 General. All Group R Occupancies shall be accessible as provided in this chapter. Public- and common-use areas and facilities such as recreational facilities, laundry facilities, garbage and recycling collection areas, mailbox locations, lobbies, foyers, and management offices shall be accessible.

EXCEPTION: Common- or public-use facilities accessory to buildings not required to contain either Type A or Type B dwelling units in accordance with Section 1103.1.8.2.

1103.1.8.2 Number of dwelling units. In all Group R, Division 1 apartment buildings the total number of Type A dwelling units shall be as required by Table No. 11-B. All other dwelling units shall be designed and constructed to the requirements for Type B units as defined in this chapter.

EXCEPTIONS: 1. Group R Occupancies containing no more than three dwelling units need not be accessible.
2. Dwelling units in Group R, Division 1 apartment buildings which are located on floors other than the ground floor where no elevator is provided within the building need not comply with standards for Type B dwelling units; provided:
2.1. Where the ground floor is not a Group R Occupancy, the first level of Group R Occupancy, including dwelling units, shall be accessible; and
2.2. The number of Type A dwelling units provided shall not be reduced below the number required by Table No. 11-B. See also Section 1105.3.1.
3. Dwelling units with two or more stories in a non-elevator building need not comply with standards for Type B dwelling units.
4. For sites where multiple, non-elevator buildings are planned for a single site and where portions of the site have grades prior to development which exceed 10 percent, the building official may approve the following modifications:
4.1. Number of Dwelling Units:
4.1.1. The number of Type B dwelling units provided may be reduced to a percentage of the ground floor units which is equal to the percentage of the entire site having grades prior to development which are 10 percent or less; but in no case shall the number of Type B dwelling units be less than 20 percent of the ground floor dwelling units on the entire site; and
4.1.2. The number of Type A dwelling units provided shall not be reduced below the number required by Table No. 11-B; and
4.2. Both Type A and B dwelling units may be located in the building or buildings located on the portion of the site where the grade prior to development has slopes of 10 percent or less; and
4.3. Common-use facilities accessory to buildings not required to contain either Type A or B dwelling units in accordance with Item 4.1.1, above, need not be accessible unless there are no other similar facilities provided on the site.
See also Appendix Chapter 11, Division I.

1103.1.8.3 Hotels and lodging houses. In all hotels and lodging houses, accessible guest rooms, including associated bathing, shower, and toilet facilities, shall be provided in accordance with Table 11-C. In addition, sleeping rooms or suites for persons with hearing impairments shall be provided in accordance with Table 11-D. In addition, public- and common-use areas of all hotels and lodging houses shall be accessible.

EXCEPTION: Group R, Division 3 lodging houses that are occupied by the owner or proprietor of the lodging house.

Required sleeping rooms for persons with hearing impairments shall have visible alarms complying with Section 1106.15. Such rooms shall have installed telephones complying with Section 1106.14.3, and an electrical outlet installed within 48 inches (1220 mm) of the telephone connection. Such rooms shall have devices separate from the visible alarm system which provide visible notification of incoming telephone calls and door bell actuation.

Where provided in accessible guest rooms the following facilities shall be accessible: dining areas; kitchens; kitchenettes; wet bars; patios; balconies; terraces; or similar facilities.

1103.1.8.4 Proportional distribution. Accessible dwelling units shall be apportioned among efficiency dwelling units, single bedroom units and multiple bedroom units, in proportion to the numbers of such units in the building. Accessible hotel guest rooms shall be apportioned among the various classes of sleeping accommodations.

1103.1.8.5 Congregate residences. In congregate residences with multi-bed rooms or spaces, a percentage equal to the minimum number of accessible rooms required by Table No. 11-C shall be accessible in accordance with Section 1106.26.

EXCEPTION: Congregate residences with 10 or fewer occupants need not be accessible.

1103.1.9 Other parking facilities. Principal use parking facilities which are not accessory to the use of any building or structure shall provide accessible spaces in accordance with Table No. 11-F.

1103.2 Design and Construction.

1103.2.1 General. When accessibility is required by this chapter, it shall be designed and constructed in accordance with this chapter.

1103.2.2 Accessible route of travel. When a building, or portion of a building, is required to be accessible, an accessible route of travel shall be provided to all portions of the building, to accessible building entrances, and connecting the building and the public way. The accessible route of travel to areas of primary function may serve but shall not pass through kitchens, storage rooms, toilet rooms, bathrooms, closets, or other similar spaces.

EXCEPTIONS: 1. A single accessible route shall be permitted to pass through a kitchen or storage room in an accessible dwelling unit.
2. An accessible route of travel need not be provided between floor levels, provided that:
All floor levels in the building contain less than 3,000 square feet (278.7 m^2) each; or
Where only two floor levels are provided, either floor is less than 3,000 square feet (278.7 m^2).
This exception shall not apply to:
2.1. The offices of health care providers; or,
2.2. Transportation facilities and airports; or,
2.3. Buildings owned or leased by government agencies; or
2.4. Multi-tenant Group M retail and wholesale occupancies of five tenant spaces or more.
3. For sites where natural terrain or other unusual property characteristics do not allow the provisions of an accessible route of travel from the public way to the building, the point of vehicular debarkation may be substituted for the accessible entrance to the site.
(For Group R, Division 1 occupancies, see Section 1105.3.1.)

Accessible routes of travel serving any accessible space or element shall also serve as a means of egress for emergencies or connect to an area of evacuation assistance.

Where more than one building or facility is located on a site, accessible routes of travel shall connect accessible buildings and accessible site facilities. The accessible route of travel shall be the most practical direct route connecting

accessible building entrances, accessible site facilities and the accessible site entrances.

1103.2.3 Primary entrance access. At least 50% of all public entrances, or a number equal to the number of exits required by Section 1003.1, whichever is greater, shall be accessible. One of the accessible public entrances shall be the primary entrance to a building. At least one accessible entrance must be a ground floor entrance. Public entrances do not include loading or service entrances.

EXCEPTION: In Group R, Division 1 apartment buildings only the primary entrance need be accessible, provided that the primary entrance provides an accessible route of travel to all dwelling units required to be accessible.

Where a building is designed not to have common or primary entrances, the primary entrance to each individual dwelling unit required to be accessible, and each individual tenant space, shall be accessible.

1103.2.4 Signs.

1103.2.4.1 International Symbol of Access. The following elements and spaces of accessible facilities shall be identified by the International Symbol of Access:

1. Accessible parking spaces.

2. Accessible entrance when not all entrances are accessible (inaccessible entrances shall have directional signage to indicate the route to the nearest accessible entrance).

EXCEPTION: Individual entrances into dwelling units.

3. Accessible passenger loading zone(s).

4. Accessible toilet and bathing facilities when not all are accessible.

EXCEPTION: Toilet and bathing facilities within dwelling units, patient rooms and guest rooms.

At every major junction along or leading to an exterior accessible route of travel, there shall be a sign displaying the International Symbol of Access. Signage shall indicate the direction to accessible entrance and facilities.

See also Sections 1103.1.2.1, 1104.2.5 and 1106.24.3.

1103.2.4.2 Other signs. Where provided, signs which identify permanent rooms and spaces shall comply with Sections 1106.16.2, 1106.16.3 and 1106.16.5. Where provided, other signs which provide direction to or information about the building or portion of a building shall comply with Sections 1106.16.3 and 1106.16.4.

EXCEPTION: Building directories and all temporary signs.

In hotels and lodging houses, a list of accessible guest rooms shall be posted permanently in a location not visible to the general public, for staff use at each reception or check-in desk.

In assembly areas, a sign notifying the general public of the availability of accessible seating and assistive listening systems shall be provided at ticket offices or similar locations.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1103, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1104 Section 1104—Egress and areas of evacuation assistance.

Section 1104.1 General. In buildings or portions of buildings required to be accessible, accessible means of egress shall be provided in the same number as required for exits by Chapter 10. When an exit required by Chapter 10 is not accessible, an area for evacuation assistance shall be provided.

EXCEPTION: Areas of evacuation assistance are not required in buildings where an approved, automatic fire-extinguishing system is installed in accordance with U.B.C. Standard No. 9-1, provided that quick-response sprinkler heads are used where allowed by the standard; and that a written fire- and life-safety emergency plan, which specifically addresses the evacuation of persons with disabilities, is approved by the building official and the fire chief.

Every area for evacuation assistance shall comply with the requirements of this code and shall adjoin an accessible route of travel which shall comply with Section 1106.

1104.2 Areas for Evacuation Assistance.

1104.2.1 Location and construction. An area for evacuation assistance shall be one of the following:

1. A portion of a landing within a smokeproof enclosure, complying with Section 1110.

2. A portion of an exterior exit balcony, located immediately adjacent to an exit stairway, when the exterior exit balcony complies with Section 1005. Openings to the interior of the building located within 20 feet (6096 mm) of the area for evacuation assistance shall be protected with fire assemblies having a three-fourths-hour fire-protection rating.

3. A portion of a one-hour fire-resistive corridor complying with Sections 1005.7 and 1005.8 located immediately adjacent to an exit enclosure.

4. A vestibule located immediately adjacent to an exit enclosure and constructed to the same fire-resistive standards as required by Section 1005.7 and 1005.8.

5. A portion of a stairway landing within an exit enclosure which is vented to the exterior and is separated from the interior of the building by not less than one-hour fire-resistive door assemblies.

6. When approved by the building official, an area or room which is separated from other portions of the building by a smoke barrier. Smoke barriers shall have a fire-resistive rating of not less than one hour and shall completely enclose the area or room. Doors in the smoke barrier shall be tight-fitting smoke- and draft-control assemblies having a fire-protection rating of not less than 20 minutes and shall be self-closing or automatic closing. The area or room shall be provided with an exit directly to an exit enclosure. When the room or area exits into an exit enclosure which is required to be of more than one-hour fire-resistive construction, the room or area shall have the same fire-resistive construction, including the same opening protection, as required for the adjacent exit enclosure.

7. An elevator lobby complying with Section 1104.4.

1104.2.2 Size. Each area for evacuation assistance shall provide at least two wheelchair spaces not smaller than 30

inches by 48 inches (760 mm by 1220 mm) for each space. The area for evacuation assistance shall not encroach on any required exit width. The total number of such wheelchair spaces per story shall not be less than 1 for every 200 persons of calculated occupant load served by the area for evacuation assistance.

EXCEPTION: The building official may reduce the minimum number of 30-inch (760 mm) by 48-inch (1220 mm) areas to one for each area for evacuation assistance on floors where the occupant load is less than 200.

1104.2.3 Stairway width. Each stairway adjacent to an area for evacuation assistance shall have a minimum clear width of 48 inches (1220 mm) between handrails.

1104.2.4 Two-way communication. A telephone with controlled access to a public telephone system or another method of two-way communication shall be provided between each area for evacuation assistance and the primary entrance. The telephone or other two-way communication system shall be located with the reach ranges specified in Section 1106.2.4. The fire department may approve location other than the primary entrance. The communication system shall not require voice communication.

1104.2.5 Identification. Each area for evacuation assistance shall be identified by a sign which states: **AREA FOR EVACUATION ASSISTANCE** and the International Symbol of Access. The sign shall be illuminated when exit sign illumination is required. The sign shall comply with Sections 1013.3 and 1013.4. In each area for evacuation assistance, instructions on the use of the area under emergency conditions shall be posted adjoining the two-way communication system.

1104.3 Accessible Exits. All exterior exits which are located adjacent to accessible areas and within 6 inches (152 mm) of grade shall be accessible.

1104.4 Area for Evacuation Assistance, High-rise Alternative. Within a building of any height or occupancy, constructed in accordance with the requirements of Section 403, an area for evacuation assistance may be located in the elevator lobby, or adjacent to the elevator where no lobby is required, when:

1. The area for evacuation assistance complies with the requirements for size, two-way communication and identification as specified in Section 1104.2; and,

2. Elevator shafts are pressurized as required for smokeproof enclosures in Section 1009. Such pressurization system shall be activated by smoke detectors on each floor located in a manner approved by the building official. Pressurization equipment and its ductwork within the building shall be separated from other portions of the building by a minimum of two-hour fire-resistive construction.

3. The manager of the building has established and maintains a written fire- and life-safety emergency plan which, in addition to other provisions, shall specifically address the evacuation of persons with disabilities. Such plan shall be approved by the building official and the fire chief.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1104, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1105 Section 1105—Facility accessibility.

Section 1105.1 General. Where buildings are required to be accessible, building facilities shall be accessible to persons with disabilities as provided in this section. For Group R, Division 1 apartment buildings, where specific floors of a building are required to be accessible, the requirements shall apply only to the facilities located on accessible floors.

All building facilities or elements required by this section to be accessible shall be designed and constructed in accordance with Section 1106.

1105.2 Bathing and Toilet Facilities.

1105.2.1 Bathing facilities. When bathing facilities are provided, at least 2 percent, but not less than 1, bathtub or shower shall be accessible. In dwelling units where a separate bathtub and shower are provided in the same room, at least one shall be accessible.

1105.2.2 Toilet facilities. Toilet facilities located within accessible dwelling units, guest rooms, and congregate residences shall comply with Sections 1106.11 and 1106.27.

EXCEPTION: Within accessible dwelling units, only one toilet facility need be accessible.

In each toilet facility in other occupancies, at least one wheelchair accessible toilet stall with an accessible water closet shall be provided. In addition, when there are 6 or more water closets within a toilet facility, at least one ambulatory accessible toilet stall complying with Section 1106.11.4 shall also be installed.

Where urinals are provided, at least one urinal shall be accessible.

1105.2.3 Lavatories, mirrors and towel fixtures. At least one accessible lavatory shall be provided within any toilet facility. Where mirrors, towel fixtures and other toilet and bathroom accessories are provided, at least one of each shall be accessible.

1105.2.4 Adaptable fixtures in dwelling units. See Section 1106.27.2 for adaptable fixtures in dwelling units.

1105.3 Elevators, Platform Lifts and Stairways.

1105.3.1 Elevators.

1105.3.1.1 Where required. In multi-story buildings or portions thereof required to be accessible by Section 1103, at least one elevator shall serve each level, including mezzanines. Other than within an individual dwelling unit, where an elevator is provided but not required, it shall be accessible.

EXCEPTIONS: 1. In Group R, Division 1 apartment occupancies, an elevator is not required where accessible dwelling units and guest rooms are accessible by ramp or by grade level route of travel.
2. In a building of fewer than three stories, an elevator is not required where ramps, grade-level entrances or accessible horizontal exits from an adjacent building, are provided to each floor.

3. In multi-story parking garages, an elevator is not required where an accessible route of travel is provided from accessible parking spaces on levels with accessible horizontal connections to the primary building served.
4. In Group R, Division 1 hotels and lodging houses, less than 3 stories in height, an elevator is not required, provided that all accessible guest rooms are located on the ground floor.

1105.3.1.2 Design. All elevators shall be accessible.

EXCEPTIONS: 1. Private elevators serving only one dwelling unit.
2. Where more than one elevator is provided in the building, elevators used exclusively for movement of freight.

Elevators required to be accessible shall be designed and constructed to comply with Chapter 296-81 of the Washington Administrative Code.

1105.3.2 Platform lifts. Platform lifts may be used in lieu of an elevator under one of the following conditions subject to approval by the building official:

1. To provide an accessible route of travel to a performing area in a Group A Occupancy; or,

2. To provide unobstructed sight lines and distribution for wheelchair viewing positions in Group A Occupancies; or

3. To provide access to spaces with an occupant load of less than 5 that are not open to the public; or,

4. To provide access where existing site or other constraints make use of a ramp or elevator infeasible.

All platform lifts used in lieu of an elevator shall be capable of independent operation and shall comply with Chapter 296-81 of the Washington Administrative Code.

1105.3.3 Stairways. Stairways shall comply with Section 1106.9.

1105.4 Other Building Facilities.

1105.4.1 Water fountains. On any floor where water fountains are provided, at least 50 percent, but in no case less than one fountain, shall be accessible complying with Section 1106.13 and at least one fountain shall be mounted at a standard height.

1105.4.2 Telephones. On any floor where public telephones are provided at least one telephone shall be accessible. On any floor where 2 or more banks of multiple telephones are provided, at least one telephone in each bank shall be accessible and at least one telephone per floor shall be designed to allow forward reach complying with Section 1106.2.4.5.

Where any bank of public telephones consists of 3 or more telephones, at least one telephone in each bank shall be equipped with a shelf and electrical outlet complying with Section 1106.14.7.

All accessible telephones and at least 25 percent of all other public telephones, but in no case less than one, shall be provided with volume controls in accordance with Section 1106.14.3 and shall be dispersed among the public telephones provided in the building.

Where four or more public telephones are provided at a building site, and at least one is in an interior location, at least one interior telephone shall be a text telephone in accordance with Section 1106.14.

Where interior public pay phones are provided in transportation facilities; assembly and similar areas including stadiums and arenas; convention centers; hotels with convention facilities; or covered malls; or in or adjacent to hospital emergency, recovery, or waiting rooms; at least one interior text telephone shall be provided.

1105.4.3 Kitchens. Kitchens within accessible dwelling units shall be designed in accordance with Sections 1106.12 and 1106.27.

EXCEPTION: Kitchens in Type B dwelling units need not comply with Section 1106.12.1 (See Section 1106.27.1).

Kitchens, kitchenettes, or wet bars in other than dwelling units, which are provided accessory to a sleeping room, guest room, or suite, shall be designed in accordance with Section 1106. Countertops and sinks shall be no more than 34 inches (865 mm) above the finished floor. At least 50 percent of shelf space in cabinets and appliances shall be within the reach ranges of Section 1106.2.4.

1105.4.4 Recreation facilities. Where common- or public-use recreational facilities, swimming pools, hot tubs, spas, and similar facilities are provided, they shall be accessible. Swimming pools shall be accessible by transfer tier, hydraulic chair, ramp, or other means. Hot tubs and spas need be accessible only to the edge of the facility.

EXCEPTION: Common- or public-use facilities accessory to buildings not required to contain either Type A or Type B dwelling units in accordance with Section 1103.1.8.2.

1105.4.5 Fixed or built-in seating or tables. Where fixed or built-in seating or tables are provided, at least 5 percent, but no fewer than one, shall be accessible. Accessible fixed or built-in seating or tables shall comply with Section 1106.19. In eating and drinking establishments, such seating or tables shall be distributed throughout the facility.

1105.4.6 Storage facilities. In other than Group R, Division 1 apartment buildings, where fixed or built-in storage facilities such as cabinets, shelves, closets, and drawers are provided in accessible spaces, at least one of each type provided shall contain storage space complying with Section 1106.18.

1105.4.7 Customer service facilities.

1105.4.7.1 Dressing and fitting rooms. Where dressing or fitting rooms are provided for use by the general public, patients, customers or employees, 5 percent, but not less than one, in each group of rooms serving distinct and different functions shall be accessible in accordance with Section 1106.24.

1105.4.7.2 Counters and windows. Where customer sales and service counters or windows are provided, a portion of the counter, or at least one window, shall be accessible in accordance with Section 1106.24.2.

1105.4.7.3 Shelving and display. Self-service shelves or display units in retail occupancies shall be located on an accessible route of travel in accordance with Section 1103.2.2. Not all self-service shelves and display units need be located within reach ranges required by Section 1106.2.4.

1105.4.7.4 Check-out aisles. Accessible check-out aisles shall be installed in accordance with Table No. 11-E and Section 1106.24.3.

1105.4.7.5 Food service lines. Where self-service shelves are provided in dining and drinking establishments, at least 50 percent of each type shall comply with Sections 1106.2 and 1106.22.

1105.4.8 Controls, operating mechanisms, and hardware. Controls, operating mechanisms, and hardware, including; switches that control lighting, ventilation or electrical outlets; in accessible spaces, along accessible routes or as parts of accessible elements, shall comply with Section 1106.3.

1105.4.9 Alarms. Where provided, alarm systems shall include both audible and visible alarms. Visible alarm devices shall be located in all assembly areas; common-use areas, including toilet rooms and bathing facilities; hallways and lobbies; and hotel guest rooms as required by Section 1103.1.8.3.

EXCEPTIONS: 1. Alarm systems in Group I, Division 1.1 and 2 Occupancies may be modified to suit standard health care design practice.
2. Visible alarms are not required in Group R, Division 1 apartment buildings.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1105, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1106 Section 1106—Accessible design and standards.

Section 1106.1 General. Where accessibility is required by this chapter, buildings and facilities shall be designed and constructed in accordance with this section, unless otherwise specified in this chapter.

1106.2 Space Allowance and Reach Ranges.

1106.2.1 Wheelchair passage width. The minimum clear width for single wheelchair passage shall be 36 inches (915 mm). The minimum width for two wheelchairs to pass is 60 inches (1525 mm).

EXCEPTION: The minimum width for single wheelchair passage may be 32 inches (815 mm) for a maximum distance of 24 inches (610 mm).

1106.2.2 Wheelchair turning spaces. Wheelchair turning spaces shall be designed and constructed to satisfy one of the following requirements:

1. A turning space not less than 60 inches (1525 mm) in diameter; or,

2. A turning space at T-shaped intersections or within a room, where the minimum width is not less than 36 inches (915 mm). Each segment of the T shall be clear of obstructions not less than 24 inches (610 mm) in each direction.

Wheelchair turning space may include knee and toe clearance in accordance with Section 1106.2.4.3.

1106.2.3 Unobstructed floor space. A floor space, including the vertical space above such floor space, which is free of any physical obstruction including door swings, to a height of 29 inches (737 mm). Where a pair of doors occurs, the swing of the inactive leaf may be considered to be unobstructed floor space. Unobstructed floor space may include toe spaces that are a minimum of 9 inches (230 mm) in height and not more than 6 inches (152 mm) in depth.

1106.2.4 Clear floor or ground spaces and maneuvering clearance space for wheelchairs.

1106.2.4.1 Size. The minimum clear floor or ground space required to accommodate a single, stationary wheelchair occupant shall be not less than 30 inches (760 mm) by 48 inches (1220 mm).

1106.2.4.2 Approach. Wheelchair spaces shall be designed to allow for forward or parallel approach to an accessible feature.

1106.2.4.3 Knee and toe clearances. Spaces under obstructions, work surfaces or fixtures may be included in the clear floor or ground space provided that they are at least 30 inches (760 mm) in width, a minimum of 27 inches (685 mm) in height, and not greater than 25 inches (635 mm) in depth. Toe spaces under obstructions, work surfaces or fixtures which comply with the requirements for unobstructed floor space may be included in the clear floor or ground space.

1106.2.4.4 Approach to wheelchair spaces. One full unobstructed side of the clear floor or ground space for a wheelchair shall adjoin or overlap an accessible route of travel, or shall adjoin another wheelchair clear space. Clear space located in an alcove or otherwise confined on all or part of three sides shall be not less than 36 inches (915 mm) in width where forward approach is provided, or 60 inches (1525 mm) in width where parallel approach is provided.

1106.2.4.5 Forward reach. Where the clear floor space allows only forward approach to an object, the maximum forward reach allowed shall not be higher than 48 inches (1220 mm). Reach obstructions 20 inches (510 mm) or less in depth may project into the clear space provided that knee clearance is maintained in accordance with Section 1106.2.4.3. Reach obstructions greater than 20 inches (510 mm) in depth may project into the clear space provided that the reach obstruction shall not exceed 25 inches (635 mm) in depth and the maximum forward reach shall not exceed 44 inches (1118 mm) in height. The minimum low forward reach shall not be lower than 15 inches (380 mm).

1106.2.4.6 Side reach. Where the clear floor space allows parallel approach by a person in a wheelchair, the maximum high side reach allowed shall not be higher than 54 inches (1370 mm). Obstructions no greater than 34 inches (865 mm) in height and no more than 24 inches (610 mm) in depth may be located in the side reach area provided that when such obstructions are present, the side reach shall not exceed 46 inches (1170 mm) in height. The minimum low side reach shall not be lower than 9 inches (230 mm).

1106.3 Controls and Hardware.

1106.3.1 Operation. Handles, pulls, latches, locks, and other operating devices on doors, windows, cabinets, plumbing fixtures, and storage facilities, shall have a lever or other shape which will permit operation by wrist or arm pressure and which does not require tight grasping, pinching or twisting to operate. Doors shall comply with Section 1004.

The force to activate controls on lavatories and water fountains and flush valves on water closets and urinals shall not be greater than 5 pounds (22.2 N).

1106.3.2 Mounting heights. The highest operable part of environmental and other controls, dispensers, receptacles, and other operable equipment shall be within at least one of the reach ranges specified in Section 1106.2.4, and not less than 36 inches (915 mm) above the floor. Electrical and communications system receptacles on walls shall be mounted a minimum of 15 inches (380 mm) above the floor. Door hardware shall be mounted at not less than 36 inches (915 mm) and not more than 48 inches (1220 mm) above the floor.

1106.3.3 Clear floor space. Clear floor space that allows a forward or a side approach shall be provided at all controls or hardware.

1106.4 Accessible Route of Travel.

1106.4.1 Width. The minimum clear width of an accessible route of travel shall be 36 inches (915 mm) except at doors (see Section 1106.10.2). Where an accessible route includes a 180 degree turn around an obstruction which is less than 48 inches (1220 mm) in width, the clear width of the accessible route of travel around the obstruction shall be 42 inches (1065 mm) minimum. For exterior accessible routes of travel, the minimum clear width shall be 44 inches (1118 mm).

EXCEPTION: The minimum width for single wheelchair passage may be 32 inches (815 mm) for a maximum distance of 24 inches (610 mm).

Where an accessible route of travel is less than 60 inches (1525 mm) in width, passing spaces at least 60 inches (1525 mm) by 60 inches (1525 mm) shall be located at intervals not to exceed 200 feet (61 m). A T-shaped intersection of two corridors or walks may be used as a passing space.

1106.4.2 Height. Accessible routes shall have a clear height of not less than 79 inches (2007 mm). Where the vertical clearance of an area adjoining an accessible route of travel is less than 79 inches (2007 mm) but more than 27 inches (685 mm), a continuous permanent barrier shall be installed to prevent traffic into such areas of reduced clearance.

1106.4.3 Slope. An accessible route of travel shall have a running slope not greater than 1 vertical in 12 horizontal. An accessible route of travel with a running slope greater than 1 vertical in 20 horizontal shall comply with Section 1106.8. Cross slopes of an accessible route of travel shall not exceed 1 vertical in 48 horizontal.

1106.4.4 Changes in level. Changes in level along an accessible route of travel shall comply with Section 1106.6. Stairs or escalators shall not be part of an accessible route of travel. Any raised area within an accessible route of travel shall be cut through to maintain a level route or shall have curb ramps at both sides and a level area not less than 48 inches (1220 mm) long connecting the ramps.

1106.4.5 Surfaces.

1106.4.5.1 General. All floor and ground surfaces in an accessible route of travel shall comply with Section 1106.7.

1106.4.5.2 Detectable warnings. Curb ramps shall have detectable warnings complying with Section 1106.17. Detectable warnings shall extend the full width and depth of the curb ramp.

1106.4.6 Illumination. Illumination shall be provided along an exterior accessible route of travel at any time the building is occupied, with an intensity of not less than one footcandle (10.76 lx) on the surface of the route.

1106.4.7 Curb ramps.

1106.4.7.1 Slope. Slopes of curb ramps shall comply with Section 1106.8. Transitions from ramps to walks, gutters, or vehicular ways shall be flush and free of abrupt changes in height. Maximum slopes of adjoining gutters and road surfaces immediately adjacent to the curb ramp or accessible route of travel shall not exceed 1 vertical in 20 horizontal.

1106.4.7.2 Width. Curb ramps shall be not less than 36 inches (915 mm) in width, exclusive of the required side slopes.

1106.4.7.3 Side slopes of curb ramps. Curb ramps located where pedestrians must walk across the ramp, or where not protected by handrails or guardrails, shall have sloped sides. The maximum side slope shall be 1 vertical in 10 horizontal. Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramp.

EXCEPTION: Where the width of the walking surface at the top of the ramp and parallel to the run of the ramp is less than 48 inches (1220 mm), the maximum side slope shall be 1 vertical in 12 horizontal.

1106.4.7.4 Location. Built-up curb ramps shall be located so as not to project into vehicular ways nor be located within accessible parking spaces.

1106.4.7.5 Obstructions. Curb ramps shall be located or protected to prevent their obstruction by parked vehicles.

1106.4.7.6 Location at marked cross walks. Curb ramps at marked cross walks shall be wholly contained within the markings, excluding any sloped sides.

1106.4.7.7 Orientation. Curb ramps shall be oriented in the same direction as pedestrian flow of crosswalks; diagonally oriented curb ramps are prohibited.

1106.4.8 Vehicular areas. Where an accessible route of travel crosses or adjoins a vehicular way, and where there are no curbs, railings or other elements which separate the pedestrian and vehicular areas, and which are detectable by a person who has a severe vision impairment, the boundary between the areas shall be defined by a continuous detectable warning not less than 36 inches (915 mm) wide, complying with Section 1106.17.

1106.5 Protruding Objects. Protruding objects shall not reduce the clear width of a route of travel or maneuvering space. Any wall- or post-mounted object with its leading edge between 27 inches (685 mm) and 79 inches (2007 mm) above the floor may project not more than 4 inches (102 mm) into a route of travel, corridor, passageway, or aisle.

Any wall- or post-mounted projection greater than 4 inches (102 mm) shall extend to the floor.

1106.6 Changes in Level. Accessible routes of travel and accessible spaces within buildings shall have continuous common floor or ramp surfaces. Abrupt change in height greater than 1/4 inch (6 mm) shall be beveled to 1 vertical in 2 horizontal. Changes in level greater than 1/2 inch (13 mm) shall be accomplished by means of a ramp meeting the requirements of Section 1106.8, a curb ramp meeting the requirements of Section 1106.4.7, or an elevator or platform lift meeting the requirements of Section 1105.3. For Type B dwelling units, see also Section 1106.27.

1106.7 Floor Coverings and Surface Treatments.

1106.7.1 General. All surfaces shall be firm and stable.

1106.7.2 Carpeting. Carpeting and floor mats in accessible areas shall be securely fastened to the underlying surface, and shall provide a firm, stable, continuous, and relatively smooth surface.

1106.7.3 Slip-resistant surfaces. Showers; locker rooms; swimming pool, spa, and hot tub decks; toilet rooms; and other areas subject to wet conditions shall have slip-resistant floors.

Exterior accessible routes of travel shall have slip-resistant surfaces.

1106.7.4 Grates. Within an accessible route of travel, grates shall have openings not more than 1/2 inch (13 mm) in one direction. Where grates have elongated openings, they shall be placed so that the long dimension is perpendicular to the dominant direction of travel. The maximum vertical surface change shall be 1/8 inch (3 mm).

1106.7.5 Expansion and construction joints. Expansion and construction joints in exterior routes of travel shall have a width of not more than 1/2 inch (13 mm), shall be filled with a firm, compressible, elastic material, and shall be substantially level with the surface of the accessible route of travel.

1106.8 Ramps.

1106.8.1 General. Ramps required to be accessible shall comply with Section 1007 and the provisions of this section. No ramp shall change direction between landings, except ramps with an inside radius of 30 feet (9144 mm) or greater.

1106.8.2 Slope and rise. The maximum slope of a ramp shall be 1 vertical in 12 horizontal. The maximum rise for any run shall be 30 inches (760 mm).

1106.8.3 Width. The minimum width of a ramp shall be not less than 36 inches (915 mm) for interior ramps and 44 inches (1118 mm) for exterior ramps.

1106.8.4 Landings. Ramps within the accessible route of travel shall have landings at the top and bottom, and at least one intermediate landing shall be provided for each 30 inches (760 mm) of rise. Landings shall be level and have a minimum dimension measured in the direction of ramp run of not less than 60 inches (1525 mm). Where the ramp changes direction at a landing, the landing shall be not less than 60 inches (1525 mm) by 60 inches (1525 mm). The width of any landing shall be not less than the width of the ramp.

1106.8.5 Handrails. Ramps having slopes steeper than 1 vertical to 20 horizontal shall have handrails as required for stairways, except that intermediate handrails as required in Section 1006.9 are not required. Handrails shall be continuous provided that they shall not be required at any point of access along the ramp, nor at any curb ramp. Handrails shall extend at least 12 inches (305 mm) beyond the top and bottom of any ramp run.

EXCEPTION: Ramps having a rise less than or equal to 6 inches (152 mm), or a run less than or equal to 72 inches (1830 mm), need not have handrails.

1106.8.6 Exterior ramps. Exposed ramps and their approaches shall be constructed to prevent the accumulation of water on walking surfaces.

1106.8.7 Edge protection. Any portion of the edge of a ramp with a slope greater than 1 vertical in 20 horizontal, or landing which is more than 1/2 inch (13 mm) above the adjacent grade or floor, shall be provided with edge protection in accordance with the following:

1. **Walls and Curbs.** When used, walls or curbs shall be not less than 2 inches (51 mm) in height above the surface of the accessible route of travel.

2. **Railings.** When used, railings shall comply with Section 1106.8.5 and also shall have one of the following features:

2.1. An intermediate rail mounted 17 to 19 inches (430 to 485 mm) above the ramp or landing surface, or

2.2. A guardrail complying with Section 509.

1106.9 Stairways.

1106.9.1 General. Stairways required to be accessible shall comply with Section 1006 and provisions of this section.

1106.9.2 Open risers. Open risers shall not be permitted.

EXCEPTION: Stairways in Group R, Division 1 apartment buildings may have open risers.

1106.9.3 Nosings. Stair nosings shall be flush, slip-resistant, and rounded to a radius of 1/2 inch (13 mm) maximum. Risers shall be sloped, or the underside of the nosing shall have an angle of not less than 60 degrees from the horizontal. Nosings shall project no more than 1-1/2 inches (38 mm).

1106.9.4 Exterior stairways. Exposed stairways and their approaches shall be constructed to prevent the accumulation of water on walking surfaces.

1106.10 Doors.

1106.10.1 General. Doors required to be accessible shall comply with Section 1004 and with provisions of this section. For the purpose of this section, gates shall be considered to be doors. An accessible gate or door shall be provided adjacent to any turnstile or revolving door. Where doorways have two independently operated door leaves, then at least one leaf shall comply with this section.

1106.10.2 Clear width. Doors shall be capable of being opened so that the clear width of the opening is not less than 32 inches (815 mm).

EXCEPTION: Doors not requiring full user passage, such as shallow closets, may have a clear opening of not less than 20 inches (510 mm).

1106.10.3 Maneuvering clearances at doors. Except as provided in Section 1106.27, all doors shall have minimum maneuvering clearances as follows:

1. For a forward approach, where a door must be pulled to be opened, an unobstructed floor space shall extend at least 18 inches (455 mm) beyond the strike jamb and extend at least 60 inches (1525 mm) perpendicular to the doorway.

2. For a forward approach, where a door must be pushed to be opened and is equipped with a closer and a latch, an unobstructed floor space shall extend at least 12 inches (305 mm) beyond the strike jamb and extend at least 48 inches (1220 mm) perpendicular to the doorway.

3. For a forward approach, where a door must be pushed to be opened and is not equipped with a closer and a latch, an unobstructed floor space shall be at least the width of the doorway and extend at least 48 inches (1220 mm) perpendicular to the doorway.

4. For a hinge side approach, where a door must be pulled to be opened, an unobstructed floor space shall extend at least 36 inches (915 mm) beyond the latch side of the door and at least 60 inches (1525 mm) perpendicular to the doorway, or shall have an unobstructed floor space that extends at least 42 inches (1065 mm) beyond the latch side of the door and at least 54 inches (1370 mm) perpendicular to the doorway.

5. For a hinge side approach, where a door must be pushed to be opened and is not equipped with both a closer and a latch, an unobstructed floor space, measured from the latch side, shall extend across the width of the doorway and beyond the hinge side of the door for a total width of not less than 54 inches (1370 mm); and at least 42 inches (1065 mm) perpendicular to the doorway.

6. For a hinge side approach, where a door must be pushed to be opened and is equipped with both latch and closer, an unobstructed floor space, measured from the latch side, shall extend across the width of the doorway and beyond the hinge side of the door for a total width of not less than 54 inches (1370 mm); and at least 48 inches (1220 mm) perpendicular to the doorway.

7. For a latch side approach, where a door must be pulled to be opened and is equipped with a closer, an unobstructed floor space shall extend at least 24 inches (610 mm) beyond the latch side of the door and at least 54 inches (1370 mm) perpendicular to the doorway.

8. For a latch side approach, where a door must be pulled to be opened and is not equipped with a closer, an unobstructed floor space shall extend at least 24 inches (610 mm) beyond the latch side of the door and at least 48 inches (1220 mm) perpendicular to the doorway.

9. For a latch side approach, where a door must be pushed to be opened and is equipped with a closer, an unobstructed floor space shall extend at least 24 inches (610 mm) beyond the latch side of the door and at least 48 inches (1370 mm) perpendicular to the doorway.

10. For a latch side approach, where a door must be pushed to be opened and is not equipped with a closer, an unobstructed floor space shall extend at least 24 inches (610 mm) parallel to the doorway, beyond the latch side of the door and at least 42 inches (1065 mm) perpendicular to the doorway.

11. For a forward approach, to a sliding or folding door, an unobstructed floor space shall extend the same width as the door opening and at least 48 inches (1220 mm) perpendicular to the doorway.

12. For a slide side approach to a sliding or folding door, an unobstructed floor space, measured from the latch side, shall extend across the width of the doorway and beyond the slide side of the door for a total width of not less than 54 inches (1370 mm); and at least 42 inches (1065 mm) perpendicular to the doorway.

13. For a latch side approach to a sliding or folding door, an unobstructed floor space shall extend at least 24 inches (610 mm) beyond the latch side of the door and at least 42 inches (1065 mm) perpendicular to the doorway.

14. Where two doors are in series, the minimum distance between two hinged or pivoted doors shall be 48 inches (1220 mm), in addition to any area needed for door swing. Doors in series shall swing either in the same direction, or away from the space between the doors.

15. All doors in alcoves shall comply with the requirement for a forward approach.

1106.10.4 Thresholds at doors. Thresholds at doors shall comply with Section 1106.6.

EXCEPTION: In dwelling units, exterior doors other than the accessible entrance to a dwelling unit, may be sliding doors with thresholds not exceeding 3/4 inch (19 mm).

1106.10.5 Automatic and power-assisted doors. Door-closers or power-operators shall be operable as required by Section 1004.8.

EXCEPTION: Floor pad or electric eye actuated power operators.

All power-operated doors shall remain in the fully open position for not less than 6 seconds before closing. Touch switches shall be mounted 36 inches (915 mm) above the floor and not less than 18 inches (455 mm), nor more than 36 inches (915 mm), horizontally from the nearest point of travel of the moving door. Other power-operated doors must be actuated from a location not less than 36 inches (915 mm) from the nearest point of travel of the moving door. Power-operated doors shall automatically reopen when they encounter an obstruction other than the strike jamb.

1106.10.6 Door closers. Where provided, door closers shall be adjusted to close from an open position of 70 degrees to a point 3 inches (76 mm) from the latch, in not less than 3 seconds, when measured to the leading edge of the door.

1106.10.7 Vision panels. Where a door contains one or more vision panels, the bottom of the glass of at least one

panel, shall be not more than 40 inches (1015 mm) above the floor.

1106.11 Bathrooms, Toilet Rooms, Bathing Facilities, and Shower Rooms.

1106.11.1 General. Bathrooms, toilet rooms, bathing facilities, and shower rooms shall be designed in accordance with this section. For dwelling units, see also Section 1106.27.

1106.11.2 Unobstructed floor space. An unobstructed floor space shall be provided within bathrooms, toilet rooms, bathing facilities, and shower rooms of sufficient size to inscribe a circle with a diameter not less than 60 inches (1525 mm). Doors in any position may encroach into this space by not more than 12 inches (305 mm). The clear floor spaces at fixtures, the accessible route of travel, and the unobstructed floor space may overlap.

1106.11.3 Wheelchair accessible toilet stalls.

1106.11.3.1 Dimensions. Wheelchair accessible toilet stalls shall be at least 60 inches (1525 mm) in width. Where wall-hung water closets are installed, the depth of the stall shall be not less than 56 inches (1420 mm). Where floor-mounted water closets are installed, the depth of the stall shall be not less than 59 inches (1500 mm). Entry to the compartment shall have a clear width of 32 inches (815 mm). Toilet stall doors shall not swing into the clear floor space required for any fixture. Except for door swing, a clear unobstructed access not less than 48 inches (1220 mm) in width shall be provided to toilet stalls.

EXCEPTION: Partitions may project not more than one inch, in the aggregate, into the required width of the stall.

1106.11.3.2 Toe clearances. In any toilet stall, the front partition and at least one side partition shall provide a toe clearance of at least 9 inches (230 mm) above the floor.

EXCEPTION: Toe clearance is not required in a stall with a depth greater than 60 inches (1525 mm).

1106.11.3.3 Door hardware. Doors of accessible toilet stalls shall comply with Section 1106.3.

1106.11.4 Ambulatory accessible toilet stalls. Ambulatory accessible toilet stalls shall be at least 36 inches (915 mm) in width, with an outward swinging, self-closing door. Grab bars shall be installed on each side of the toilet stall and shall comply with Sections 1106.11.5.3 and 1106.11.11.

1106.11.5 Water closets.

1106.11.5.1 Clear floor space. The lateral distance from the center line of the water closet to the nearest obstruction, excluding grab bars, shall be 18 inches (455 mm) on one side and not less than 42 inches (1065 mm) on the other side. In other than stalls, a clear floor space of not less than 32 inches (815 mm), measured perpendicular to the wall on which the water closet is mounted, shall be provided in front of the water closet.

EXCEPTION: In other than a toilet stall, a lavatory may be located within the clear floor space required for a water closet provided that knee and toe clearances for the lavatory comply with Section 1106.11.7, below, and:
1. In Type B dwelling units the edge of the lavatory shall be located not less than 15 inches (380 mm) from the centerline of the water closet; or,
2. In all other occupancies the edge of the lavatory shall be located not less than 18 inches (455 mm) from the centerline of the water closet.

1106.11.5.2 Height. The height of water closets shall be a minimum of 17 inches (430 mm) and a maximum of 19 inches (485 mm) measured to the top of the seat. Seats shall not be sprung to return to a lifted position.

1106.11.5.3 Grab bars. Grab bars shall be installed at one side and at the back of the water closet. The top of grab bars shall be not less than 33 inches (840 mm) and not more than 36 inches (915 mm) above and parallel to the floor. Grab bars located at the side shall be a minimum 42 inches (1065 mm) in length located not more than 12 inches (305 mm) from the rear wall and extending at least 54 inches (1370 mm) from the rear wall. Grab bars located at the back shall be a minimum of 36 inches (915 mm) in length and shall extend at least 12 inches (305 mm) beyond the center of the water closet toward the side wall and at least 24 inches (610 mm) toward the open side of the water closet. Grab bars located at the back shall be mounted not more than 9 inches (230 mm) behind the water closet seat. See also Section 1106.11.11.

1106.11.5.4 Flush controls. Flush controls shall be mounted for use from the wide side of the water closet area and not more than 44 inches (1118 mm) above the floor. Flush valves shall comply with Section 1106.3.

1106.11.5.5 Dispensers and receptacles. Toilet paper and other dispensers or receptacles shall be installed within easy reach of the water closet, and shall not interfere with unobstructed floor space or grab bar utilization.

1106.11.6 Urinals. A clear floor space measuring 30 inches (760 mm) in width by 48 inches (1220 mm) in depth shall be provided in front of urinals to allow for forward approach. Urinal shields shall have a clear space between them of not less than 29 inches (737 mm) and shall not extend farther than the front edge of the urinal rim. Urinals shall be stall-type or wall-hung with an elongated rim at a maximum of 17 inches(430 mm) above the floor. Flush controls shall be mounted not more than 44 inches(1118 mm) above the floor. Flush valves shall comply with Section 1106.3.

1106.11.7 Lavatories and sinks.

1106.11.7.1 Clear floor space. A clear floor space not less than 30 inches (760 mm) in width by 48 inches (1220 mm) in depth shall be provided in front of lavatories and sinks to allow a forward approach. The clear floor space may include knee and toe clearances not to exceed 19 inches (485 mm) extending under the lavatory or sink.

1106.11.7.2 Height. Lavatories and sinks shall be mounted with the rim or counter surface no higher than 34 inches (865 mm) above the finished floor.

1106.11.7.3 Knee and toe clearances.

1106.11.7.3.1 Lavatories. The total depth of the clear space beneath a lavatory shall be not less than 17 inches (430 mm), of which toe clearance shall be not more than 6 inches (152 mm) of the total depth. Knee clearance shall be not less than 29 inches (237 mm) in height and 30 inches (760 mm) in width.

1106.11.7.3.2 Sinks. Knee clearance not less than 27 inches (685 mm) in height, 30 inches (760 mm) in width, and 19 inches (485 mm) in depth shall be provided underneath sinks.

1106.11.7.4 Exposed pipes and surfaces. Hot water and drain pipes exposed under lavatories and sinks shall be insulated or otherwise covered. There shall be no sharp or abrasive surfaces under lavatories or sinks.

1106.11.7.5 Faucets. Faucet control handles shall be located not more than 17 inches (430 mm) from the front edge of the lavatory, sink or counter, and shall comply with Section 1106.3. Self-closing valves shall remain open for at least 10 seconds per operation.

1106.11.7.6 Sink depth. Sinks shall be not more than 6-1/2 inches (165 mm) in vertical depth.

1106.11.8 Mirrors, dispensers, and other fixtures. Mirrors or shelves shall be installed so that the bottom of the mirror or the top of the shelf is within 40 inches (1015 mm) of the floor.

Drying equipment, towel or other dispensers, and disposal fixtures shall be mounted so as to not exceed 40 inches (1015 mm) above the finished floor to any rack, operating controls, receptacle or dispenser.

1106.11.9 Bathtubs.

1106.11.9.1 Clear floor space. A clear floor space not less than 60 inches (1525 mm) in length shall be provided along the tub. Where the required seat is located at the end of the tub, the clear floor space shall be not less than 75 inches (1905 mm) in length. The clear floor space shall be not less than 30 inches (760 mm) in width where access to the space is parallel to the tub and not less than 48 inches (1220 mm) in width where access to the space is at right angles to the tub.

A lavatory which complies with Section 1106.11.7, above, may be located in the clear floor space for the tub.

Where a seat is provided and a lavatory is located in the clear floor space for the tub, the lavatory shall be located at the end of the tub adjacent to the controls.

1106.11.9.2 Seats. An in-tub seat or a seat at the end of the tub shall be provided. In-tub seats shall be portable and removable, not less than 12 inches (305 mm) in width, and extend the full width of the tub. Seats at the end of the tub shall be constructed flush with the top of the tub and shall extend not less than 15 inches (380 mm) from the end of the tub. Seats shall be mounted securely and shall not slip during use.

1106.11.9.3 Grab bars. All required grab bars shall be installed parallel to the floor. Lower grab bars shall be installed centered 9 inches (230 mm) above the tub rim. Upper or single grab bars shall be installed centered not less than 33 inches (840 mm) and not more than 36 inches (915 mm) above the floor of the clear space.

Where a tub has a seat at the end, two grab bars not less than 48 inches (1220 mm) in length shall be installed on the wall opposite the clear floor space. One end of each grab bar shall terminate where the tub abuts the seat.

Where a tub has an in-tub seat, two grab bars, not less than 24 inches (610 mm) in length, shall be installed on the wall opposite the clear floor space. The grab bars shall extend to not less than 24 inches (610 mm) from one end of the tub and not less than 12 inches (305 mm) from the other end. One grab bar shall be installed on the wall at the end of the tub opposite the drain, extending at least 12 inches (305 mm) from the clear floor space.

For all bathtubs, one grab bar shall be installed on the wall at the end of the tub nearest the drain, extending at least 24 inches (610 mm) from the clear floor space.

1106.11.9.4 Controls and fixtures. Faucets and other controls shall be located above the tub rim and below the grab bars, shall be offset laterally from the clear floor space between the open edge of the tub and the mid-point of the tub and shall comply with Section 1106.3.

A shower spray unit, with a hose at least 60 inches (1525 mm) long, that can be used as a fixed shower head or as a hand-held shower, shall be provided.

1106.11.9.5 Bathtub enclosures. Where provided, enclosures for bathtubs shall not obstruct controls or obstruct transfer from wheelchairs onto bathtub seats or into tubs. Bathtub enclosures shall not have tracks mounted on the tub rim.

1106.11.10 Shower stalls.

1106.11.10.1 Configuration. Shower stalls shall have one of the following configurations:

1. Transfer shower stalls shall be 36 inches by 36 inches (915 by 915 mm), nominal, and shall have a seat; or,

2. Roll-in shower stalls shall be not less than 30 inches (760 mm) in depth by 60 inches (1525 mm) in length.

1106.11.10.2 Clear floor space. A clear floor space shall be provided adjacent to shower stalls.

1. For transfer shower stalls, a clear floor space not less than 48 inches (1220 mm) in length, parallel to the open side of the shower stall, and not less than 36 inches (915 mm) in width, perpendicular to the open edge of the shower stall, shall be located so as to extend at least 12 inches (305 mm) beyond the wall on which the seat is mounted.

2. For roll-in shower stalls, a clear floor space not less than 60 inches (1525 mm) in length, parallel to the open edge of the shower stall, and not less than 36 inches (915 mm) in width, perpendicular to the open edge of the shower stall, shall be provided. A lavatory which complies with Section 1106.11.7, above, may be located within one end of the clear floor space. Where a seat is provided in the shower, a lavatory may be located only at the opposite end of the clear space.

1106.11.10.3 Seats. Transfer shower stalls shall be provided with a folding or non-folding seat located on the wall opposite the shower controls.

Roll-in shower stalls shall be provided with a folding seat located on the wall adjacent to the shower controls.

EXCEPTION: Roll-in shower stalls located in occupancies other than hotels, lodging houses and congregate residences need not be provided with a seat.

The seat shall be mounted not less than 17 inches (430 mm) and not more than 19 inches (485 mm) above the floor. The seat shall be mounted not more than 1-1/2 inches (38 mm) from the shower walls. The leading edge of the seat may be set back not more than 1-1/2 inches (38 mm) from the leading edge of the shower stall.

The seat shall be L-shaped and shall extend the full depth of the stall. The section of the seat adjacent to the wall opposite the clear floor space shall be at least 22 inches (560 mm) and not more than 23 inches (585 mm) wide, measured from the wall on which the seat is mounted. That section of the seat shall extend not less than 14 inches (355 mm) but not more than 15 inches (380 mm), measured from the wall opposite the clear floor space. The remaining portion of the seat shall be not less than 15 inches (380 mm) and not more than 16 inches (405 mm) wide, measured from the wall on which the seat is mounted, and shall extend the remaining depth of the stall.

1106.11.10.4 Grab bars. All required grab bars shall be installed parallel to the floor. All grab bars shall be installed not less than 33 inches (840 mm) and not more than 36 inches (915 mm) above the floor of the adjacent clear space.

For transfer shower stalls, a grab bar, not less than 18 inches (455 mm) in length, shall be installed on the wall opposite the clear floor space. One end of the grab bar shall terminate at the wall opposite the seat. A grab bar not less than 27 inches (685 mm) in length shall also be installed on the wall opposite the seat.

For roll-in shower stalls, grab bars shall be provided on all permanent stall walls. Grab bars located on either end of the stall shall be not less than 27 inches (685 mm) in length. The grab bar located opposite the clear space shall be not less than 48 inches (1220 mm) in length.

1106.11.10.5 Controls and fixtures. Faucets and other controls shall be located on the same wall as the shower spray unit, and shall be installed not less than 38 inches (965 mm) or more than 48 inches (1220 mm) above the shower floor and shall comply with Section 1106.3. In addition:

1. For transfer shower stalls, the controls shall be located on the wall opposite the shower seat. The controls shall be located within 18 inches (455 mm) of the open side of the shower stall.

2. For roll-in shower stalls equipped with seats, the controls shall be mounted on the wall adjacent to the seat not more than 27 inches (685 mm) from the wall where the seat is mounted. For roll-in shower stalls without seats, the controls may be located on any wall. Where the controls are located on the back wall, they shall be located not more than 27 inches (685 mm) from a side wall.

A shower spray unit, with a hose at least 60 inches (1525 mm) long, that can be used as a fixed shower head or as a hand-held shower, shall be provided.

EXCEPTION: In unmonitored facilities where vandalism is a consideration, a fixed shower head may be installed not more than 48 inches (1220 mm) above the stall floor.

1106.11.10.6 Thresholds. In transfer shower stalls, thresholds shall be flush or beveled with a maximum edge height of 1/2 inch (13 mm), and a maximum slope of not more than 1 vertical in 2 horizontal.

Thresholds in roll-in shower stalls shall be level with the adjacent clear space.

1106.11.10.7 Shower enclosures. Where provided, enclosures for shower stalls shall not obstruct controls or obstruct transfer from wheelchairs onto shower seats.

1106.11.11 Structural requirements for grab bars, and tub and shower seats.

1106.11.11.1 General. All grab bars, and tub and shower seats required to be accessible, shall comply with this section.

1106.11.11.2 Size and spacing of grab bars. Grab bars shall have an outside diameter of not less than 1-1/4 inch (32 mm) nor more than 1-1/2 inches (38 mm) and shall provide a clearance of 1-1/2 inches (38 mm) between the grab bar and the wall.

1106.11.11.3 Structural strength. The structural strength of grab bars, tub and shower seats, fasteners and mounting devices shall meet the following specification:

1. Bending stress in a grab bar or seat induced by the maximum bending moment from the application of 300 pounds (1334 N) shall be less than the allowable stress for the material of the grab bar or seat.

2. Shear stress induced in a grab bar or seat by the application of 300 pounds (1334 N) shall be less than the allowable shear stress for the material of the grab bar or seat. If the connection between the grab bar or seat and its mounting bracket or other support is considered to be fully restrained, then direct and torsional shear stresses shall be totaled for the combined shear stress, which shall not exceed the allowable shear stress.

3. Shear force induced in a fastener or mounting device from the application of 300 pounds (1334 N) shall be less than the allowable lateral load of either the fastener or mounting device or the supporting structure, whichever is the smaller allowable load.

4. Tensile force induced in a fastener by a direct tension force of 300 pounds (1334 N) plus the maximum moment from the application of 300 pounds (1334 N) shall be less than the allowable withdrawal load between the fastener and the supporting structure.

1106.11.11.4 Special hazards. A grab bar and any wall or other surface adjacent to it shall be free of any sharp or abrasive elements. Edges shall have a minimum radius of 1/8 inch (3 mm).

1106.12 Kitchens.

1106.12.1 Clear floor space. An unobstructed floor space shall be provided within kitchens of sufficient size to inscribe a circle with a diameter not less than 60 inches (1525 mm). Doors in any position may encroach into this space by not more than 12 inches (305 mm). The clear floor spaces at fixtures, the accessible route of travel, and the unobstructed floor space may overlap.

1106.12.2 Counter surfaces and shelving. Within Type A dwelling units, a counter surface, a minimum of 30 inches (760 mm) wide by 24 inches (610 mm) deep, shall be provided at a maximum height of 34 inches (865 mm), with a knee space beneath at least 27 inches (685 mm) in height.

In other than dwelling units, at least 50 percent of shelf space in cabinets, refrigerators and freezers shall be within the reach ranges specified in Section 1106.2.4.

1106.13 Water Fountains.

1106.13.1 Clear floor space. Wall- and post-mounted cantilevered units shall have a minimum clear floor space in front of the unit, of 30 inches (760 mm) in width by 48 inches (1220 mm) in depth to allow a forward approach.

Free-standing or built-in units not having a clear space beneath them shall have an adjacent clear floor space at least 30 inches (760 mm) in depth by 48 inches (1220 mm) in width in order to allow a person in a wheelchair to make a parallel approach to the unit.

1106.13.2 Knee space. Wall- and post-mounted cantilevered units shall have knee space in accordance with Section 1106.2.4.3. The knee space shall be not less than 17 inches (430 mm) nor more than 19 inches (485 mm) in depth.

1106.13.3 Spout location. Spouts shall be located not more than 36 inches (915 mm) above the floor or ground surface. Spouts shall be located at the front of the unit and shall direct a water flow not less than 4 inches (102 mm) in height, in a trajectory parallel to the front of the unit. Recessed units shall be installed such that the spout is not recessed beyond the plane of the wall.

1106.13.4 Controls. Controls shall be located not more than 6 inches (152 mm) from the front of the unit and shall comply with Section 1106.3. The force required to activate the control shall not exceed 5 pounds (22.2 N).

1106.13.5 Water fountains in alcoves. Where a unit is installed in an alcove greater than 8 inches (205 mm) in depth, the alcove shall be not less than 48 inches (1220 mm) in width. A minimum 24 inches (610 mm) of clear space shall be provided from the spout to the nearest side wall of the alcove.

1106.14 Telephones.

1106.14.1 Clear floor or ground space. A clear floor or ground space, not less than 30 inches (760 mm) by 48 inches (1220 mm), that allows either a forward or parallel approach, shall be provided in front of telephones. Bases, enclosures and fixed seats shall not project into the clear floor space.

Where parallel approach is provided, any shelf or enclosure shall not project farther than 10 inches (255 mm) beyond the face of the telephone.

Where a forward approach is provided, any shelf shall not project farther than 20 inches (510 mm) beyond the face of the telephone; any enclosure panels shall be a minimum 30 inches (760 mm) apart, and where less than 36 inches (915 mm) apart, shall project no more than 24 inches (610 mm) beyond the face of the phone.

1106.14.2 Height. The highest operable part of a telephone shall be within the reach ranges specified in Section 1106.2.4.

1106.14.3 Equipment for persons with hearing impairments. Telephones shall be equipped with volume controls and shall be hearing aid compatible. Volume controls shall be capable of increasing volume not less than 12 dbA nor more than 18 dbA above normal.

EXCEPTION: Where an automatic reset is provided, 18 dbA may be exceeded.

1106.14.4 Controls. Telephones shall have pushbutton controls where service for such equipment is available.

1106.14.5 Cord length. The cord from the telephone to the handset shall be not less than 29 inches (737 mm) in length.

1106.14.6 Text telephones. Text telephones shall be permanently affixed within, or adjacent to, the telephone enclosure. Where an acoustic coupler is used, the telephone cord shall be sufficiently long to allow connection of the text telephone and the telephone receiver.

1106.14.7 Shelf and electrical outlet. Shelves and an electrical outlet shall be located within or adjacent to the telephone enclosure. The shelf shall be not less than 10 inches by 10 inches (255 mm by 255 mm) in dimension, with a vertical clearance above the shelf of not less than 6 inches (152 mm). The telephone handset shall be capable of being placed flush on the surface of the shelf.

1106.15 Alarms.

1106.15.1 Audible alarms. Audible alarms shall produce a sound in accordance with the Fire Code.

1106.15.2 Visible alarms. Visible alarm signal appliances shall be integrated into the building or facility alarm system. Where single-station audible alarms are provided, single-station visible alarm signals shall be provided.

EXCEPTION: Dwelling units in Group R, Division 1 apartment buildings.

Visible alarms shall be located not less than 80 inches (2030 mm) above floor level, or 6 inches (152 mm) below the ceiling, whichever is lower, and at an interval of not more than 50 feet (15 m) horizontal, in rooms, corridors, and hallways.

In rooms or spaces exceeding 100 feet (30 m) in horizontal dimension, with no obstructions exceeding 6 feet (1830 mm) in height above the finished floor, visible alarms may be placed around the perimeter at intervals not to exceed 100 feet (30 m) horizontally.

Visible alarm signals shall comply with the following criteria:

1. The lamp shall be a xenon strobe type or equivalent.

2. The color shall be clear or unfiltered white light.

3. The maximum pulse duration shall be two-tenths of one second (0.2 sec) with a maximum duty cycle of 40 percent. The pulse duration is defined as the time interval between initial and final point of 10 percent of maximum signal.

4. The intensity shall be a minimum of 75 candela.

5. The flash rate shall be a minimum of 1 Hz and a maximum of 3 Hz.

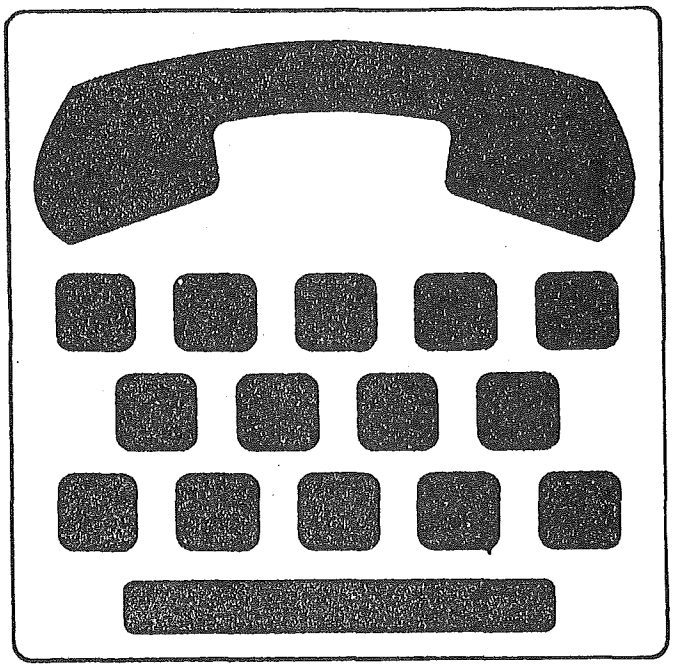
1106.15.3 Access to manual fire alarm systems. Manual fire alarm devices shall be mounted not more than 54 inches (1370 mm) above the floor where a parallel approach is provided.

1106.16 Signage.

1106.16.1 Symbols.

1106.16.1.1 International Symbol of Access. The International Symbol of Access shall be as shown below:

1106.16.1.2 Text telephones. Text Telephones required by Section 1105.4.2 shall be identified by the International Text Telephone Symbol as shown below:



1106.16.1.3 Assistive listening systems. Permanently installed assistive listening systems that are required by Section 1103.1.2.2 shall be identified by the International Symbol of Access for Hearing Loss as shown below:

1106.16.1.4 Volume control telephones. Telephones required by Section 1105.4.2 to have volume controls shall be identified by a handset containing a depiction of a telephone handset with radiating sound waves.

1106.16.2 Mounting location and height. Signs shall be installed on the wall adjacent to the latch side of the door. Signs shall be centered at 60 inches (1525 mm) above the finished floor. Mounting location for such signage shall be such that a person may approach within 3 inches (76 mm) of

signage without encountering protruding objects or standing within the swing of a door.

1106.16.3 Finish and color. Characters and symbols shall have a high contrast with their background. The character and background of interior signs shall be eggshell, matte, or other nonglare finish.

All interior and exterior signs depicting the International Symbol of Access shall be white on a blue background.

1106.16.4 Character proportion and height. Letters and numbers on signs shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10.

Characters and numbers on signs shall be sized according to the viewing distance from which they are to be read. The minimum character height for signs that are suspended or projected overhead is 3 inches (76 mm) for upper case letters. Lower case letters are permitted.

1106.16.5 Raised and Braille characters and pictorial symbol signs (pictograms).

1106.16.5.1 Raised characters and symbols. Characters and symbols on tactile signs shall be raised at least 1/32 inch (.8 mm). Raised characters and symbols shall be simple type face upper case characters. Raised characters and symbols shall be between 5/8 inch (16 mm) and 2 inches (51 mm) in height. Raised characters shall be accompanied by Braille in accordance with this section.

1106.16.5.2 Braille. Braille shall be separated from the corresponding raised characters or symbols. Braille shall be Grade 2.

1106.16.5.3 Pictograms. Where provided, pictograms shall be accompanied by the equivalent verbal description placed directly below the pictogram. The border dimension of the pictogram shall be not less than 6 inches (152 mm) in height.

1106.17 Detectable Warnings. Detectable warnings on walking surfaces shall consist of raised truncated domes having a diameter of 0.9 inches (23 mm) nominal, a height of 0.2 inches (5 mm) nominal, and a center-to-center spacing of 2.35 inches (60 mm) nominal, and shall contrast visually with adjoining surfaces.

1106.18 Storage, Shelving and Display Units.

1106.18.1 Clear floor space. Storage, shelving and display units shall have a clear floor space, not less than 30 inches (760 mm) by 48 inches (1220 mm), that allows for either a forward or parallel approach.

1106.18.2 Height. Accessible storage, shelving and display units shall be within the reach ranges specified in Section 1106.2.4. Clothes rods shall be not more than 54 inches (1370 mm) above the floor.

1106.19 Seating, Tables, and Sinks.

1106.19.1 Clear floor space. Sinks and seating spaces at tables shall have a clear floor space of not less than 30 inches (760 mm) by 48 inches (1220 mm), that allows forward approach. The clear floor space shall not overlap knee space by more than 19 inches (483 mm).

1106.19.2 Knee clearances. Knee spaces at tables, counters, and sinks shall be provided in accordance with Section 1106.2.4.3. In addition, the depth of the knee space shall be not less than 19 inches (483 mm). No projection which might obstruct the arm of a wheelchair may intrude into this clearance, within 24 inches (610 mm) horizontally from the table edge.

1106.19.3 Height. The tops of tables and sinks shall be not less than 28 inches (710 mm) nor more than 34 inches (865 mm) in height above the floor or ground.

1106.20 Aisles. All aisles required to be accessible, including check out aisles, food service lines, and aisles between fixed tables, shall be not less than 36 inches (915 mm) in width.

1106.21 Assembly Areas.

1106.21.1 Wheelchair spaces.

1106.21.1.1 Location. Wheelchair spaces shall be an integral part of any fixed seating plan and shall be dispersed throughout the seating area. Spaces shall adjoin an accessible route of travel that also serves as a means of egress and shall be located to provide lines of sight comparable to those for all viewing areas.

EXCEPTION: Accessible viewing positions may be clustered for bleachers, balconies and other areas having sight lines that require slopes of greater than 5 percent. Equivalent accessible viewing positions may be located on levels having accessible egress.

1106.21.1.2 Size. Wheelchair spaces shall be not less than 33 inches (840 mm) in width. Where forward or rear approach is provided, wheelchair spaces shall be not less than 48 inches (1220 mm) in depth. Where only side approach is provided, wheelchair spaces shall be not less than 60 inches (1525 mm) in depth.

1106.21.1.3 Surfaces. The ground or floor surfaces at wheelchair locations shall be level and shall comply with Section 1106.7.

1106.21.2 Placement of assistive listening systems. Where an assistive listening system serves individual fixed seats, such seats shall have a clear line of sight and shall be located not more than 50 feet (15 m) from the stage or performance area.

1106.22 Restaurants and Cafeterias.

1106.22.1 Aisles. Aisles to fixed tables required to be accessible shall comply with Section 1106.20.

1106.22.2 Food service lines.

1106.22.2.1 Clear floor space. Food service lines shall comply with Section 1106.20.

1106.22.2.2 Height. Tray slides shall be mounted not more than 34 inches (865 mm) in height above the floor.

1106.22.2.3 Counters and bars. Where service of food or drink is provided at counters more than 34 inches (865 mm) in height, to customers seated on stools or standing, a portion of the main counter shall be provided in compliance with Section 1106.19, or service shall be available at accessible tables within the same area.

1106.22.2.4 Tableware and condiment areas. Self-service shelves and dispensing devices for tableware, dishware, condiments, food, and beverages shall be installed to comply with Section 1106.18.

1106.23 Patient bedrooms. Each patient bedroom shall be designed and constructed to provide space for a 180-degree turn that complies with Section 1106.2.2. Each patient room shall have a minimum clear floor space not less than 36 inches (915 mm) on each side of any bed.

1106.24 Customer Service Facilities.

1106.24.1 Dressing and fitting rooms.

1106.24.1.1 Clear floor space. Each dressing and fitting room shall have a clear floor space complying with Section 1106.2.

EXCEPTION: Dressing and fitting rooms that are entered through a curtained opening need not comply with Section 1106.2.2.

1106.24.1.2 Doors. All doors to accessible dressing and fitting rooms shall comply with Section 1106.10.

1106.24.1.3 Benches. Every accessible dressing or fitting room shall have a bench installed adjacent to the longest wall in the room. The bench shall be not less than 24 inches (610 mm) in width and 48 inches (1220 mm) in length, and shall be mounted not less than 17 inches (430 mm) nor more than 19 inches (483 mm) above the finished floor.

Clear floor space shall be provided adjacent to the bench to allow for parallel transfer, and the structural strength of the bench shall comply with Section 1106.11.11.3.

Where benches are installed in dressing and fitting rooms adjacent to showers, swimming pools, or other wet locations, water shall not accumulate upon the surface of the bench and the bench shall have a slip-resistant surface.

1106.24.1.4 Mirrors. Where provided, mirrors in accessible dressing and fitting rooms shall be not less than 18 inches (455 mm) in width by 54 inches (1370 mm) in height and shall be mounted opposite the bench.

1106.24.2 Counters and windows. Where counters are required to be accessible, the accessible portion shall be not less than 36 inches (915 mm) in length and not more than 36 inches (915 mm) in height above the finished floor.

Where accessible windows are required, they shall be no more than 36 inches (915 mm) in height above the finished floor.

EXCEPTION: An auxiliary counter with a maximum height of 36 inches (915 mm) is installed in close proximity to the main counter.

1106.24.3 Check-out aisles. The width of accessible check-out aisles shall comply with Section 1106.20. Counters in accessible check-out aisles shall be not more than 38 inches (965 mm) in height, and the top of the raised edge of the counter shall not exceed 40 inches (1015 mm) in height above the finished floor.

Accessible check-out aisles shall be identified by the International Symbol of Access in accordance with Section 1106.16.1.1.

1106.25 Libraries.

1106.25.1 Reading and study areas. At least 5 percent, or a minimum of one, of each element of fixed seating, tables, or study carrels shall comply with Section 1106.19. Clearances between fixed accessible tables and study carrels shall comply with Section 1106.20.

1106.25.2 Check-out areas. At least one lane at each check-out area shall comply with Section 1106.20. Any traffic control or book security gates or turnstiles shall comply with Section 1106.10.

1106.25.3 Card catalogs, magazine displays and stacks.

1106.25.3.1 Aisles. Aisles between card catalogs, magazine displays or stacks shall comply with Section 1106.20.

1106.25.3.2 Height. Card catalogs or magazine displays shall have a reach height of not more than 54 inches (1370 mm) for side approach and not more than 48 inches (1220 mm) for forward approach.

Not all shelves in library stacks need be located within reach ranges required by Section 1106.2.4.

1106.26 Hotels and Congregate Residences.

1106.26.1 Clear floor space. Each sleeping room shall have a space complying with Section 1106.4.1, along both sides of each bed.

EXCEPTION: In rooms with two beds, only one 36 inch (915 mm) wide maneuvering space need be provided between the two beds.

1106.26.2 Accessible route of travel. An accessible route of travel complying with Section 1103.2.2 shall connect all accessible spaces and elements; including telephones, patios, terraces, balconies, carports, garages or parking spaces; with all accessible sleeping rooms.

1106.26.3 Doors. Doors within all sleeping rooms, suites or other covered units shall comply with Section 1106.10.

1106.26.4 Storage. Where fixed or built-in storage is provided in accessible units, sleeping rooms, or suites; including cabinets, shelves, closets, and drawers; at least one of each type shall comply with Section 1106.18.

1106.26.5 Controls. All controls in accessible units, sleeping rooms, and suites shall comply with Section 1106.3.

1106.27 Dwelling Units.

1106.27.1 Type A and B dwelling units. Type A and B dwelling units shall comply with Section 1106.

EXCEPTIONS:
1. In a Type A accessible dwelling unit with two or more stories, access to other levels is not required if the accessible level complies with all requirements for Type A accessible dwelling units and that kitchen, toilet and bathing facilities, and at least one bedroom are provided on the accessible level.
2. Kitchens in Type B dwelling units need not comply with Section 1106.12.1, provided that:
2.1. A clear space at least 30 inches by 48 inches (760 mm by 1220 mm) that allows parallel approach by a person in a wheelchair is provided at the range or cook top and sink, and either a parallel or forward approach is provided at all other appliances; and,
2.2. In all other kitchens, clearance between all opposing counters, base cabinets, countertops, appliances, and walls shall be not less than 40 inches (1015 mm); and,

2.3. In "U" shaped kitchens with a sink, range, or cooktop at the base of the "U", an unobstructed floor space of sufficient size to inscribe a circle with a diameter of not less than 60 inches (1525 mm) shall be provided.
3. Bathrooms in Type B dwelling units need not comply with Section 1106.11.2, provided that sufficient maneuvering space which is not less than 30 inches by 48 inches (760 by 1220 mm) is provided within the bathroom. Doors may swing into the clear floor space provided at any fixture, but shall not encroach on the required maneuvering space.
4. Doors in Type B dwelling units, other than the primary entry door, need not comply with Section 1106.10.3.
5. Mezzanines in Type A or B dwelling units need not be accessible.
6. Raised or sunken floors in Type B dwelling units need not be accessible, provided that they do not interfere with the accessible route of travel through the unit, and are not located in the kitchen or bathroom.
7. Counter surfaces in Type B dwelling units need not comply with Section 1106.12.2.
8. Within an individual dwelling unit in an elevatored building, access to other levels is not required if the accessible level complies with all requirements for accessible dwelling units and contains a bathroom.
9. In Type B dwelling units, exterior deck, patio, or balcony surfaces may be no more than 4 inches (100 mm) below the floor level of the interior surface where the exterior surface is constructed of an impervious material such as concrete, brick, or flagstone.
10. Vanities or lavatories in Type A and B dwelling units may be located in the clear floor spaces as permitted in Section 1106.11.5.1.
11. Seats for bathtubs or showers are not required in Type B dwelling units.
12. In Type B dwelling units, the clear floor space for bathtubs or showers may be reduced to not less than 30 inches (760 mm) in width by 48 inches (1220 mm) in length.

1106.27.2 Adaptable fixtures for dwelling units.

1106.27.2.1 Grab bars. Grab bars may be omitted in bathing and toilet facilities within Type A or B dwelling units, provided that all structural reinforcements for grab bar installation are provided in the appropriate locations in the adjoining walls.

1106.27.2.2 Kitchen counters. Cabinets or shelving may be installed beneath the counter space required by Section 1106.12.2, provided that such cabinetry or shelving is not permanent, and is easily removable.

1106.27.2.3 Lavatories. Cabinets or shelving may be installed beneath bathroom lavatories provided that such cabinetry or shelving is not permanent, and is easily removable.

1106.27.2.4 Signage. Parking signage required by Section 1107.3 need not be installed in spaces designated for accessible dwelling units.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1106, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1107 Section 1107—Parking facilities.

Section 1107.1 Accessible Parking Required.

1107.1.1 General. For other than Group R, Division 1 apartment buildings, when parking lots or garage facilities are provided, accessible parking spaces shall be provided in accordance with Table No. 11-F.

1107.1.2 Inpatient and outpatient medical care facilities. For Group I, Division 1.1, 1.2 and 2 units and facilities specializing in the treatment of persons with mobility impairments on either an inpatient or outpatient basis, 20 percent of the parking spaces provided accessory to such units and facilities shall be accessible.

1107.1.3 Outpatient medical care facilities. For Group I, Division 1.1 and 1.2 Occupancies providing outpatient medical care facilities, 10 percent of the parking spaces provided accessory to such occupancies shall be accessible.

1107.1.4 Apartment buildings. For Group R, Division 1 apartment buildings where parking is provided, one accessible parking space shall be provided for each Type A dwelling unit and reserved for it's occupants. In addition, where the total parking provided on a site exceeds 1 parking space per dwelling unit, not less than 2 percent, and in no case less than 1 space, of this additional parking shall be accessible.

1107.1.5 Van parking. For other than Group R, Division 1 apartment buildings, where accessible parking is required, one of every eight accessible parking spaces, or fraction thereof, shall be designed to be accessible to vans.

1107.1.6 Location of parking. Accessible parking spaces shall be located on the shortest possible accessible route of travel to an accessible building entrance. In facilities with multiple accessible building entrances with adjacent parking, accessible parking spaces shall be dispersed and located near the accessible entrances. Wherever practical, the accessible route of travel shall not cross lanes of vehicular traffic. Where crossing traffic lanes is necessary, the route of travel shall be designated and marked as a crosswalk.

EXCEPTION: In multilevel parking structures, all accessible van parking spaces may be located on the same level.

Where a parking facility is not accessory to a particular building, accessible parking spaces shall be located on the shortest accessible route to an accessible pedestrian entrance to the parking facility.

1107.2 Design and Construction.

1107.2.1 General. When accessible parking spaces are required by this section, they shall be designed and constructed in accordance with this section.

1107.2.2 Size. Parking spaces shall be not less than 96 inches (2440 mm) in width and shall have an adjacent access aisle not less than 60 inches (1525 mm) in width. Van accessible parking spaces shall have an adjacent access aisle not less than 96 inches (2440 mm) in width.

Where two adjacent spaces are provided, the access aisle may be shared between the two spaces. Boundaries of access aisles shall be marked so that the aisles will not be used as parking space.

1107.2.3 Vertical clearance. Where accessible parking spaces are required for vans, the vertical clearance shall be not less than 114 inches (2895 mm) at the parking space and

along at least one vehicle access route to such spaces from site entrances and exits.

1107.2.4 Slope. Accessible parking spaces and access aisles shall be located on a surface with a slope not to exceed 1 vertical in 48 horizontal.

1107.2.5 Surface. Parking spaces and access aisles shall be firm, stable, smooth, and slip-resistant.

1107.3 Signs. Every parking space required by this section shall be identified by a sign, centered between 3 and 5 feet (915 mm and 1525 mm) above the parking surface, at the head of the parking space. The sign shall include the International Symbol of Access and the phrase "State Disabled Parking Permit Required".

Van accessible parking spaces shall have an additional sign mounted below the International Symbol of Access identifying the spaces as "Van Accessible."

EXCEPTION: Where all of the accessible parking spaces comply with the standards for van accessible parking spaces.

(See also Section 1106.27.2)

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1107, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1108 Section 1108—Passenger loading zones.

Section 1108.1 Location. Where provided, passenger loading zones shall be located on an accessible route of travel.

1108.2 Design and Construction.

1108.2.1 General. Passenger loading zones shall be designed and constructed in accordance with this section.

1108.2.2 Size. Passenger loading zones shall provide an access aisle not less than 60 inches (1525 mm) in width by 20 feet (6 m) in length with the long dimension abutting and parallel to: A: the vehicle space on one side; and B: an accessible route of travel on the other.

1108.2.3 Slope. Such zones shall be located on a surface with a slope not exceeding 1 vertical in 48 horizontal.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1108, filed 12/21/94, effective 6/30/95.]

PART III - ACCESSIBILITY FOR EXISTING BUILDINGS

WAC 51-30-1109 Section 1109—Scope.

Section 1109.1 General. The provisions of this part apply to renovation, alterations, and additions to existing buildings including those identified as historic buildings. This chapter includes minimum standards for removing architectural barriers, and providing and maintaining accessibility for persons with disabilities to existing buildings and their related facilities.

1109.2 Equivalent Facilitation. Departures from specific technical and scoping requirements of this part by the use of alternate methods are permitted where such methods will provide equivalent or greater access to, and usability of, the facility. Alternate methods shall permit individuals with disabilities to approach, enter, and use a site, building, facility or portion thereof; as easily, safely, conveniently, and independently as the specified method.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1109, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1110 Section 1110—Definitions.

Section 1110. For the purpose of this part, certain terms are designated as follows:

ALTERATION is any change, addition, or modification in construction or occupancy.

ALTERATION, SUBSTANTIAL is any alteration, where the total cost of all alterations (including but not limited to electrical, mechanical, plumbing, and structural changes) for a building or facility within any 12-month period amounts to 60 percent or more of the appraised value.

PATH OF TRAVEL means a continuous, unobstructed way of pedestrian passage by means of which an altered area may be approached, entered, and exited, and which connects the altered area with an exterior approach (including sidewalks, streets, and parking areas), an entry to the facility, and other parts of the facility. For the purposes of this part, the term path of travel also includes restrooms, telephones, and water fountains serving the altered area.

TECHNICALLY INFEASIBLE means that an alteration has little likelihood of being accomplished because existing structural conditions would require removing or altering a load-bearing member which is an essential part of the structural frame, or because site constraints prohibit modification or addition of elements, spaces, or features which are in full and strict compliance with the minimum requirements for new construction and necessary to provide accessibility.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1110, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1111 Section 1111—Additions.

Section 1111 Additions. New additions may be made to existing buildings without making the entire building comply, provided the new additions conform to the provisions of Part II of this chapter, except as follows:

1. **Entrances.** Where a new addition to a building or facility does not have an accessible entrance, at least one entrance in the existing building or facility shall be accessible.

2. **Accessible Route.** Where the only accessible entrance to the addition is located in the existing building or facility, at least one accessible route of travel shall be provided through the existing building or facility to all rooms, elements and spaces in the new addition which are required to be accessible.

3. **Toilet and Bathing Facilities.** Where there are no toilet rooms and bathing facilities in an addition and these facilities are provided in the existing building, then at least one toilet and bathing facility in the existing facility shall comply with Section 1106 or with Section 1112.3.7.

4. **Group I Occupancies.** Where patient rooms are added to an existing Group I Occupancy, a percentage of the additional rooms equal to the requirement of Section 1103.1.6, but in no case more than the total number of rooms required by Section 1103.1.6, shall comply with Section 1106.23. Where toilet or bathing facilities are part of the accessible rooms, they shall comply with Section 1106.11.

5. **Path of Travel.** Where an addition affects the access to or use of an area of primary function, to the maximum extent feasible, the path of travel to the area of primary function shall be made accessible.

EXCEPTION: Subject to the approval of the building official, the path of travel need not be made accessible if the cost of compliance with this part would exceed 20 percent of the total cost of construction, inclusive of the cost of eliminating barriers, within a 36-month period.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1111, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1112 Section 1112—Alterations.

Section 1112 Alterations.

1112.1 General.

1112.1.1 Compliance. Alterations to existing buildings or facilities shall comply with this section. No alteration shall reduce or have the effect of reducing accessibility or usability of a building, portion of a building, or facility. If compliance with this section is technically infeasible, the alteration shall provide accessibility to the maximum extent feasible.

EXCEPTION: Except when substantial as defined by Section 1110, alterations to Group R, Division 1 apartment buildings need not comply with this section.

1112.1.2 Existing elements. Where existing elements, spaces, essential features or common areas are altered, each such altered element, space, feature, or area shall comply with the applicable provisions of Part II of this chapter. Where an alteration is to an area of primary function, to the maximum extent feasible, the path of travel to the altered area shall be made accessible. See also Appendix Chapter 11 Division II.

EXCEPTIONS: 1. An accessible route of travel need not be provided to altered elements, spaces or common areas which are not areas of primary function.
2. Areas of evacuation assistance need not be added to an altered building.
3. Subject to the approval of the building official, the path of travel need not be made accessible if the cost of compliance with this part would exceed 20 percent of the total cost of construction, inclusive of the cost of eliminating barriers, within an 36-month period.

1112.1.3 Installation of stairs or escalators. Where an escalator or new stairway is planned or installed requiring major structural changes, then a means of vertical transportation (e.g. elevator, platform lift) shall be provided in accordance with this chapter.

1112.1.4 Other requirements.

1112.1.4.1 Where alterations of single elements, when considered together, amount to an alteration of a room or space in a building or facility, the entire area or space shall be accessible.

1112.1.4.2 No alteration of an existing element, space or area of a building shall impose a requirement for greater accessibility than that which would be required for new construction.

1112.1.4.3 Where the alteration work is limited solely to the electrical, mechanical or plumbing system or hazardous materials removal, and does not involve the alteration, structural or otherwise, of any elements and spaces required to be accessible under these standards, Chapter 11 does not apply.

1112.1.4.4 Where alterations would increase the number of public pay telephones to four, with at least one in the interior, or where the facility has four or more public pay telephones and one or more is altered; at least one interior text telephone shall be provided in accordance with Section 1106.14.

1112.1.4.5 Where a building has an accessible entrance, altered entrances need not be made accessible unless they provide access to areas of primary function.

1112.1.4.6 Where sleeping rooms are altered in an existing Group R, Division 1 hotel, at least 1 sleeping room that complies with Section 1106.26 shall be provided for each 25 sleeping rooms or fraction thereof. In addition, at least 1 sleeping room for each 25 sleeping rooms or fraction thereof shall have telephones, visible alarms, and visible notification devices in accordance with Section 1103.1.8.3.

1112.1.4.7 Where patient bedrooms are altered in an existing Group I Occupancy, a percentage of the altered bedrooms equal to the requirement of Section 1103.1.6, but in no case more than the total number of bedrooms required by Section 1103.1.6, shall comply with Section 1106.23. Where toilet or bathing facilities are part of the accessible rooms, they shall comply with Section 1106.11.

1112.2 Substantial Alterations. Where substantial alteration as defined in Section 1110 occurs to a building or facility, the entire building or facility shall comply with Part II of this code.

EXCEPTIONS: 1. Areas of evacuation assistance need not be added to a substantially altered building.
2. Type B Dwelling units need not be provided in buildings which are substantially altered.

1112.3 Modifications.

1112.3.1 General. The following modifications set forth in this section may be used for compliance where the required standard is technically infeasible or when providing access to historic buildings.

1112.3.2 Ramps. Curb ramps and ramps constructed on existing sites, or in existing buildings or facilities, may have slopes and rises greater than specified in Part II of this chapter, where space limitations preclude the use of 1 vertical in 12 horizontal slope or less, provided that:

1. A slope not greater than 1 vertical in 10 horizontal is allowed for a maximum rise of 6 inches (152 mm).

2. A slope not greater than 1 vertical in 8 horizontal is allowed for a maximum rise of 3 inches (76 mm).

3. Slopes greater than 1 vertical in 8 horizontal are prohibited.

1112.3.3 Stairways. Full extension of stair handrails is not required when such extension would be hazardous or impossible due to plan configuration. When an accessible elevator is provided, existing stairs need not be made accessible.

1112.3.4 Elevators. Elevators shall comply with Chapter 296-81, Washington Administrative Code.

1112.3.5 Platform lifts. Upon the approval of the building official, platform lifts may be used in alterations, in locations in addition to those permitted in Part II of this chapter, if installation of an elevator is technically infeasible.

Platform lifts shall comply with Chapter 296-81 of the Washington Administrative Code.

1112.3.6 Doors.

1112.3.6.1 Clearance. When existing elements prohibit strict compliance with the clearance requirements, a projection of 5/8 inch (16 mm) maximum is permitted for the latch side door stop.

1112.3.6.2 Thresholds. Existing thresholds measuring 3/4 inch (19 mm) high or less which are modified to provide a beveled edge on each side, may be retained.

1112.3.7 Toilet rooms.

1112.3.7.1 Shared facilities. The addition of one unisex toilet facility accessible to all occupants on the floor may be provided in lieu of making existing toilet facilities accessible when it is technically infeasible to comply with either part of Chapter 11. The unisex facility shall be located in the same area as existing facilities.

1112.3.7.2 Number. The number of toilet facilities and water closets required by the Uniform Plumbing Code may be reduced by one, in order to provide accessible features.

1112.3.7.3 Signage. When existing toilet facilities are altered and not all are made accessible, directional signage complying with Section 1106.16.3 and 1106.16.4 shall be provided indicating the location of the nearest accessible toilet facility.

1112.3.8 Assembly areas. Seating shall adjoin an accessible route of travel that also serves as a means of emergency egress or route to an area for evacuation assistance. In alterations, accessibility to raised or sunken dining areas, or to all parts of outdoor seating areas is not required provided that the same services and amenities are provided in an accessible space usable by the general public and not restricted to use by people with disabilities.

1112.3.9 Dressing rooms. Where it is technically infeasible to meet the requirements of Part II of this chapter, one dressing room for each sex, or a unisex dressing room, on each level shall be accessible.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1112, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1113 Section 1113—Historic preservation.

Section 1113.1 General. Generally the accessibility provisions of this part shall be applied to historic buildings and facilities as defined in Section 3403.5 of this code.

The building official, after consulting with the appropriate historic preservation officer, shall determine whether provisions required by this part for accessible routes of travel (interior or exterior), ramps, entrances, toilets, parking, or signage would threaten or destroy the historic significance of the building or facility.

If it is determined that any of the accessibility requirements listed above would threaten or destroy the historic significance of a building or facility, the modifications of Section 1112.3 for that feature may be utilized.

1113.2 Special Provisions. Where removing architectural barriers or providing accessibility would threaten or destroy the historic significance of a building or facility, the following special provisions may be used:

1. At least one accessible route from a site access point to an accessible route of travel shall be provided.

2. At least one accessible entrance which is used by the public shall be provided.

EXCEPTION: Where it is determined by the building official that no entrance used by the public can comply, access at any accessible entrance which is unlocked during business hours may be used provided directional signs are located at the primary entrance, and the accessible entrance has a notification system. The route of travel for the accessible entrance shall not pass through hazardous areas, storage rooms, closets, kitchens or spaces used for similar purposes.

3. Where toilet facilities are provided, at least one toilet facility complying with Section 1111 and 1112 shall be provided along an accessible route. Such toilet facility shall be a shared facility available to both sexes.

4. Accessible routes from an accessible entrance to all publicly used spaces, on at least the level of accessible entrance, shall be provided. Access should be provided to all levels of a building or facility when practical. Displays and written information and documents shall be located where they can be seen by a seated person.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1113, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1114 Section 1114—Appeal.

Section 1114.1 Request for Appeal. An appeal from the standards for accessibility for existing buildings may be filed with the building official in accordance with Section 105, when existing structural elements or physical constraints of the site prevent full compliance or would threaten or destroy the historical significance of a historic building.

1114.2 Review.

1114.2.1 Consideration of alternative methods. Review of appeal requests shall include consideration of alternative methods which may provide partial access.

1114.2.2 Waiver or modification of requirements. The appeals board may waive or modify the requirements of this section when it is determined that compliance with accessibility requirements would threaten or destroy the historic significance of a building or facility.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1114, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1120 Table No. 11-A.

TABLE NO. 11-A
WHEELCHAIR SPACES REQUIRED IN ASSEMBLY AREAS

Capacity of Seating in Assembly Area	Number of Required Wheelchair Spaces
4 to 25	1
26 to 50	2
51 to 300	4
301 to 500	6
over 500	6 plus 1 for each 100 over 500

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1120, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1121 Table No. 11-B.

TABLE NO. 11-B
REQUIRED TYPE A DWELLING UNITS

Total Number of Dwelling Units on Site	Required Number of Type A Dwelling Units
0 - 10	None
11 - 20	1
21 - 40	2
41 - 60	3
61 - 80	4
81 - 100	5
For every 20 units or fractional part thereof, over 100	1 additional

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1121, filed 12/21/94, effective 6/30/95.]

TABLE NO. 11-C
NUMBER OF ACCESSIBLE ROOMS AND ROLL-IN SHOWERS

Total Number Of Rooms[1]	Minimum Required Accessible Rooms[1]	Rooms With Roll-In Showers
1 - 25	1	None
26 - 50	2	None
51 - 75	3	1
76 - 100	4	1
101 - 150	5	2
151 - 200	6	2
201 - 300	7	3
301 - 400	8	4
401 - 500	9	4 plus 1 for every 100 rooms or fraction thereof, over 400
501 - 1000	2% of total rooms	
Over 1000	20 plus 1 for every 100 rooms or fraction thereof, over 1000	

[1] For congregate residences the numbers in these columns shall apply to beds rather than rooms.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1122, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1123 Table No. 11-D.

TABLE NO. 11-D
NUMBER OF ACCESSIBLE ROOMS FOR PERSONS WITH HEARING IMPAIRMENTS

Total Number Of Rooms	Minimum Required Rooms
1 - 25	1
26 - 50	2
51 - 75	3
76 - 100	4
101 - 150	5
151 - 200	6
201 - 300	7
301 - 400	8
401 - 500	9
501 - 1000	2% of total rooms
Over 1000	20 plus 1 for every 100 rooms, or fraction thereof, over 1000

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1123, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1124 Table No. 11-E.

TABLE NO. 11-E
REQUIRED CHECK-OUT AISLES

Total Check-out Aisles Units on Site	Minimum Number of Accessible Check-out Aisles
1 - 4	1
5 - 8	2
9 - 15	3
Over 15	3 plus 20% of additional aisles

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1124, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1125 Table No. 11-F.

TABLE NO. 11-F
NUMBER OF ACCESSIBLE PARKING SPACES

Total Parking Spaces in Lot or Garage	Minimum Required Number of Accessible Spaces
1 - 25	1
26 - 50	2
51 - 75	3
76 - 100	4
101 - 150	5
151 - 200	6
201 - 300	7
301 - 400	8
401 - 500	9
501 - 1000	2% of total spaces
Over 1000	20 spaces plus 1 space for every 100 spaces, or fraction thereof, over 1000

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1125, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1200 Chapter 12—Interior environment.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1200, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1203 Section 1203—Light and ventilation in Group R Occupancies.

1203.1 General. For the purpose of determining the light or ventilation for Group R Occupancies required by this section, any room may be considered as a portion of an adjoining room when one half of the area of the common wall is open and unobstructed and provides an opening of not less than one tenth of the floor area of the interior room or 25 square feet (2.3 m²), whichever is greater.

Exterior openings for natural light or ventilation required by this section shall open directly onto a public way or a yard or court as set forth in Section 1203.4.

EXCEPTIONS: 1. Required exterior openings may be open into a roofed porch where the porch:
1.1 Abuts a public way, yard or court; and
1.2 Has a ceiling height of not less than 7 feet (2134 mm); and
1.3 Has a longer side at least 65 percent open and unobstructed.
2. Skylights.

1203.2 Light. Guest rooms and habitable rooms within a dwelling unit or congregate residence shall be provided with natural light by means of exterior glazed openings with an area not less than one tenth of the floor area of such rooms with a minimum of 10 square feet (0.93 m²).

EXCEPTION: Kitchens in Group R Occupancies may be provided with artificial light.

1203.3 Ventilation. Guest rooms and habitable rooms within a dwelling unit or congregate residence shall be provided with natural ventilation by means of openable exterior openings with an area of not less than one twentieth of the floor area of such rooms with a minimum of 5 square feet (0.46 m²).

In lieu of required exterior openings for natural ventilation, a mechanical ventilating system may be provided. Such system shall be capable of providing two air changes per hour in guest rooms, dormitories, habitable rooms and in public corridors with a minimum of 15 cubic feet per minute (7 L/s) of outside air per occupant during such time as the building is occupied.

Bathrooms, water closet compartments, laundry rooms and similar rooms shall be provided with natural ventilation by means of openable exterior openings with an area not less than one twentieth of the floor area of such rooms with a minimum of 1 1/2 square feet (0.14 m²).

In lieu of required exterior openings for natural ventilation in bathrooms containing a bathtub or shower or combination thereof, laundry rooms, and similar rooms, a mechanical ventilation system connected directly to the outside capable of providing five air changes per hour shall be provided. The point of discharge shall be at least 3 feet (914 mm) from any opening which allows air entry into occupied portions of the building. Bathrooms which contain only a water closet or lavatory or combination thereof, and similar rooms may be ventilated with an approved mechanical recirculating fan or similar device designed to remove odors from the air.

1203.4 Yards or Courts.

1203.4.1 General. This section shall apply to yards and courts adjacent to exterior openings that provide required natural light or ventilation. Such yards and courts shall be on the same property as the building.

1203.4.2 Yards. Yards shall not be less than 3 feet (914 mm) in width for one-story and two-story buildings. For buildings more than two stories in height, the minimum width of the yard shall be increased at the rate of 1 foot (305 mm) for each additional story. For buildings exceeding 14 stories in height, the required width of the yard shall be computed on the basis of 14 stories.

1203.4.3 Courts. Courts shall not be less than 3 feet (914 mm) in width. Courts having windows opening on opposite sides shall not be less than 6 feet (1829 mm) in width. Courts bounded on three or more sides by the walls of the building shall not be less than 10 feet (3048 mm) in length unless bounded on one end by a public way or yard. For buildings more than two stories in height, the court shall be increased 1 foot (305 mm) in width and 2 feet (610 mm) in length for each additional story. For buildings exceeding 14 stories in height, the required dimensions shall be computed on the basis of 14 stories.

Adequate access shall be provided to the bottom of all courts for cleaning purposes. Every court more than two stories in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet (0.93 m²) in area and leading to the exterior of the building unless abutting a yard or public way. The construction of the air intake shall be as required for the court walls of the building, but in no case shall be less than one-hour fire resistive.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1203, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1600 Chapter 16—Structural forces.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1600, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1614 Section 1614—Definitions.

The following definitions apply only to this part:

BASIC WIND SPEED is the fastest-mile wind speed associated with an annual probability of 0.02 measured at a point 33 feet (10 000 mm) above the ground for an area having exposure category C.

EXPOSURE B has terrain with buildings, forest or surface irregularities, covering at least 20 percent of the ground level area extending 1 mile (1.61 km) or more from the site.

EXPOSURE C has terrain which is flat and generally open, extending one-half mile (0.81 km) or more from the site in any full quadrant.

EXPOSURE D represents the most severe exposure in areas with basic wind speeds greater than 80 miles per hour (mph) (129 km/h) and has terrain which is flat and unobstructed facing large bodies of water over one mile (1.61 km) or more in width relative to any quadrant of the building site. Exposure D extends inland from the shoreline 1/4 mile (0.40 km) or 10 times the building height, whichever is greater.

FASTEST-MILE WIND SPEED is the wind speed obtained from wind velocity maps prepared by the National Oceanographic and Atmospheric Administration and is the highest sustained average wind speed based on the time required for a mile-long sample of air to pass a fixed point.

OPENINGS are apertures or holes in the exterior wall boundary of the structure. All windows or doors or other openings shall be considered as openings unless such openings and their frames are specifically detailed and designed to resist the loads on elements and components in accordance with the provisions of this section.

PARTIALLY ENCLOSED STRUCTURE OR STORY is a structure or story which has more than 15 percent of any windward projected area open and in which the area of opening on all other projected areas is less than half of that on the windward projection.

SPECIAL WIND REGION is an area where local records and terrain features indicate 50-year fastest-mile basic wind speed is higher than shown in Figure 16-1.

UNENCLOSED STRUCTURE OR STORY is a structure which has 85 percent or more openings on all sides.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1614, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1700 Chapter 17—Structural test and inspections.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1700, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1702 Section 1702—Structural observation.

Structural observation shall be provided in Seismic Zone 3 or 4 when one of the following conditions exists:

1. The structure is defined in Table 16-K as Occupancy Category I, II or III, or

2. The structure is required to comply with Section 403, or

3. When so designated by the architect or engineer of record, or

4. When such observation is specifically required by the building official for unusual lateral force-resisting structures or irregular structures as defined in Section 1627.

The owner shall employ the engineer or architect responsible for the structural design, or another engineer or architect designated by the engineer or architect responsible for the structural design, to perform structural observations as defined in Section 220. Observed deficiencies shall be reported in writing to the owner's representative, special inspector, contractor and the building official. The structural observer shall submit to the building official a written statement that the site visits have been made and identifying any reported deficiencies which, to the best of the structural observer's knowledge, have not been resolved.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1702, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1900 Chapter 19—Concrete.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1900, filed 12/21/94, effective 6/30/95.]

WAC 51-30-1909 Section 1909—Strength and serviceability requirements.

1909.0 Notations.

A_g = gross area of section, square inches (mm^2).

A'_s = area of compression reinforcement, square inches (mm^2).

b = width of compression face of member, inches (mm).

D = dead loads, or related internal moments and forces.

d = distance from extreme compression fiber to centroid of tension reinforcement, inches (mm).

d' = distance from extreme compression fiber to centroid of compression reinforcement, inches (mm).

d_s = distance from extreme tension fiber to centroid of tension reinforcement, inches (mm).

E = load effects of earthquake, or related internal moments and forces.

E_c = modulus of elasticity of concrete, pounds per square inch (MPa). See Section 1908.1.

F = loads due to weight and pressures of fluids with well-defined densities and controllable maximum heights, or related internal moments and forces.

f'_c = specified compressive strength of concrete, pounds per square inch (MPa).

$\sqrt{f'_c}$ = square root of specified compressive strength of concrete, pounds per square inch (MPa).

f_{ct} = average splitting tensile strength of lightweight aggregate concrete, pounds per square inch (MPa).

f_r = modulus of rupture of concrete, pounds per square inch (MPa).

f_y = specified yield strength of nonprestressed reinforcement, pounds per square inch (MPa).

H = loads due to weight and pressure of soil, water in soil, or other materials, or related internal moments and forces.

h = overall thickness of member, inches (mm).

I_{cr} = moment of inertia of cracked section transformed to concrete.

I_e = effective moment of inertia for computation of deflection.

I_g = moment of inertia of gross concrete section about centroidal axis, neglecting reinforcement.

L = live loads, or related internal moments and forces.

l = span length of beam or one-way slab, as defined in Section 1908.7; clear projection of cantilever, inches (mm).

l_n = length of clear span in long direction of two-way construction, measured face to face of supports in slabs without beams and face to face of beams or other supports in other cases.

M_a = maximum moment in member at stage deflection is computed.

M_{cr} = cracking moment. See Formula (9-8).

P_b = nominal axial load strength at balanced strain conditions. See Section 1910.3.2.

P_n = nominal axial load strength at given eccentricity.

T = cumulative effects of temperature, creep, shrinkage and differential settlement.

U = required strength to resist factored loads or related internal moments and forces.

W = wind load, or related internal moments and forces.

w_c = weight of concrete, pounds per cubic foot (kg/m^3).

y_t = distance from centroidal axis of gross section, neglecting reinforcement, to extreme fiber in tension.

α = ratio of flexural stiffness of beam section to flexural stiffness of a width of slab bounded laterally by center line of adjacent panel (if any) on each side of beam. See Section 1913.

α_m = average value of α for all beams on edges of a panel.

β = ratio of clear spans in long-to-short direction of two-way slabs.

ξ = time-dependent factor for sustained load. See Section 1909.5.2.5.

λ = multiplier for additional long-time deflection as defined in Section 1909.5.2.5.

ρ' = reinforcement ratio for nonprestressed compression reinforcement, A'_g/bd.

ϕ = strength-reduction factor. See Section 1909.3.

1909.1 General.

1909.1.1 Structures and structural members shall be designed to have design strengths at all sections at least equal to the required strengths calculated for the factored loads and forces in such combinations as are stipulated in this code.

1909.1.2 Members also shall meet all other requirements of this code to ensure adequate performance at service load levels.

1909.2 Required Strength.

1909.2.1 Required strength U to resist dead load D and live load L shall be at least equal to

$$U = 1.4D + 1.7L \quad (9\text{-}1)$$

1909.2.2 If resistance to structural effects of a specified wind load W are included in design, the following combinations of D, L and W shall be investigated to determine the greatest required strength U

$$U = 0.75\ (1.4D + 1.7L + 1.7W) \quad (9\text{-}2)$$

where load combinations shall include both full value and zero value of L to determine the more severe condition, and

$$U = 0.9D + 1.3W \quad (9\text{-}3)$$

but for any combination of D, L and W, required strength U shall not be less than Formula (9-1).

1909.2.3 If resistance to specified earthquake loads or forces E are included in design, load combinations of Section 1909.2.2 shall apply, except that $1.1E$ shall be substituted for W. *Load factors contained in Section 1921 and 1926 shall be used where applicable.*

1909.2.4 If resistance to earth pressure H is included in design, required strength U shall be at least equal to

$$U = 1.4D + 1.7L + 1.7H \quad (9\text{-}4)$$

except that where D or L reduces the effect of H, $0.9D$ shall be substituted for $1.4D$ and zero value of L shall be used to determine the greatest required strength U. For any combination of D, L and H, required strength U shall not be less than Formula (9-1).

1909.2.5 If resistance to loadings due to weight and pressure of fluids with well-defined densities and controllable maximum heights F is included in design, such loading shall have a load factor of 1.4 and be added to all loading combinations that include live load.

1909.2.6 If resistance to impact effects is taken into account in design, such effects shall be included with live load L.

1909.2.7 Where structural effects T of differential settlement, creep, shrinkage or temperature change may be significant in design, required strength U shall be at least equal to

$$U = 0.75\ (1.4D + 1.4T + 1.7L) \quad (9\text{-}5)$$

but required strength U shall not be less than

$$U = 1.4\ (D + T) \quad (9\text{-}6)$$

Estimations of differential settlement, creep, shrinkage or temperature change shall be based on a realistic assessment of such effects occurring in service.

1909.3 Design Strength.

1909.3.1 Design strength provided by a member, its connection to other members and its cross sections, in terms of flexure, axial load, shear and tension, shall be taken as the nominal strength calculated in accordance with requirements and assumptions of this code, multiplied by a strength-reduction factor ϕ.

1909.3.2 Strength-reduction factor ϕ shall be as follows:

1909.3.2.1 Flexure, without axial load 0.90

1909.3.2.2 Axial load and axial load with flexure. (For axial load with flexure, both axial load and moment nominal strength shall be multiplied by appropriate single value of ϕ.)

Axial tension and axial tension with flexure . . . 0.90

Axial compression and axial compression with flexure:

Members with spiral reinforcement conforming to Section 1910.9.3 . . . . . 0.75

Other reinforced members 0.70

except that for low values of axial compression, ϕ may be increased in accordance with the following:

For members in which f_y does not exceed 60,000 psi (413.7 MPa), with symmetric reinforcement, and with $(h - d' - d_s)/h$ not less than 0.70, ϕ may be increased linearly to 0.90 as ϕPn decreases from $0.10\ f'_c\ A_g$ to zero.

For other reinforcing members, ϕ may be increased linearly to 0.90 as ϕPn decreases from $0.10\ f'_c\ A_g$ or ϕP_b, whichever is smaller, to zero.

1909.3.2.3 Shear and torsion (*See also Section 1909.3.4 for shear walls and frames in Seismic Zones 3 and 4*) . . 0.85

1909.3.2.4 Bearing on concrete (See also Section 1918.13) 0.70

1909.3.3 Development lengths specified in Section 1912 do not require a ϕ factor.

1909.3.4 In *Seismic Zones 3 and 4*, strength-reduction factors shall be as given above except for the following:

1909.3.4.1 *The shear strength-reduction factor shall be 0.6 for the design of walls, topping slabs used as diaphragms over precast concrete members and structural framing members, with the exception of joints, if their nominal shear strength is less than the shear corresponding to development*

of their nominal flexural strength. The shear strength-reduction factor for joints shall be 0.85.

1909.4 Design Strength for Reinforcement. Designs shall not be based on a yield strength of reinforcement f_y in excess of 80,000 psi (551.6 MPa), except for prestressing tendons.

1909.5 Control of Deflections.

1901.5.1 Reinforced concrete members subject to flexure shall be designed to have adequate stiffness to limit deflections or any deformations that affect strength or serviceability of a structure adversely.

1909.5.2 One-way construction (nonprestressed).

1909.5.2.1 Minimum thickness stipulated in Table 19-C-1 shall apply for one-way construction not supporting or attached to partitions or other construction likely to be damaged by large deflections, unless computation of deflection indicates a lesser thickness may be used without adverse effects.

1909.5.2.2 Where deflections are to be computed, deflections that occur immediately on application of load shall be computed by usual methods or formulas for elastic deflections, considering effects of cracking and reinforcement on member stiffness.

1909.5.2.3 Unless stiffness values are obtained by a more comprehensive analysis, immediate deflection shall be computed with the modulus of elasticity E_c for concrete as specified in Section 1908.5.1 (normal-weight or lightweight concrete) and with the effective moment of inertia as follows, but not greater than I_g.

$$I_e = \left(\frac{M_{cr}}{M_a}\right)^3 I_g + \left[1 - \left(\frac{M_{cr}}{M_a}\right)^3\right] I_{cr} \qquad (9\text{-}7)$$

WHERE:

$$M_{cr} = \frac{f_r I_g}{y_t} \qquad (9\text{-}8)$$

and for normal-weight concrete

$$f_r = 7.5\sqrt{f'_c} \qquad (9\text{-}9)$$

For SI:

$$f_r = 0.62\sqrt{f'_c}$$

When lightweight aggregate concrete is used, one of the following modifications shall apply:

1. When f_{ct} is specified and concrete is proportioned in accordance with Section 1905.2, f_r shall be modified by substituting $f_{ct}/6.7$ (For SI: $1.8\sqrt{f'_c}$) for $\sqrt{f'_c}$, but the value of $f_{ct}/6.7$ (For SI: $1.8\sqrt{f'_c}$) shall not exceed $\sqrt{f'_c}$.

2. When f_{ct} is not specified, f_r shall be multiplied by 0.75 for "all-lightweight" concrete, and 0.85 for "sand-lightweight" concrete. Linear interpolation may be used when partial sand replacement is used.

1909.5.2.4 For continuous members, effective moment of inertia may be taken as the average of values obtained from Formula (9-7) for the critical positive and negative moment sections. For prismatic members, effective moment of inertia may be taken as the value obtained from Formula (9-7) at midspan for simple and continuous spans, and at support for cantilevers.

1909.5.2.5 Unless values are obtained by a more comprehensive analysis, additional longtime deflection resulting from creep and shrinkage of flexural members (normal-weight or lightweight concrete) shall be determined by multiplying the immediate deflection caused by the sustained load considered, by the factor

$$\lambda = \frac{\xi}{1 + 50\rho'} \qquad (9\text{-}10)$$

where ρ' shall be the value at midspan for simple and continuous spans, and at support for cantilevers. It is permitted to assume the time-dependent factor for sustained loads to be equal to

Five years or more	2.0
12 months	1.4
Six months	1.2
Three months	1.0

1909.5.2.6 Deflection computed in accordance with this section shall not exceed limits stipulated in Table 19-I.

1909.5.3 Two-way construction (nonprestressed).

1909.5.3.1 This section shall govern the minimum thickness of slabs or other two-way construction designed in accordance with the provisions of Section 1913 and conforming with the requirements of Section 1913.6.1.2. The thickness of slabs without interior beams spanning between the supports on all sides shall satisfy the requirements of Section 1909.5.3.2 or 1909.5.3.4. Thickness of slabs with beams spanning between the supports on all sides shall satisfy the requirements of Section 1909.5.3.3 or 1909.5.3.4.

1909.5.3.2 For slabs without interior beams spanning between the supports and having a ratio of long to short span not greater than 2, the minimum thickness shall be in accordance with the provisions of Table 19-C-2 and shall not be less than the following values:

1. Slabs without drop panels as defined in Sections 1913.4.7.1 and 1913.4.7.2 . 5 inches (127 mm)

2. Slabs with drop panels as defined in Sections 1913.4.7.1 and 1913.4.7.2 . . 4 inches (102 mm)

1909.5.3.3 For slabs with beams spanning between the supports on all sides, the minimum thickness shall be as follows:

1. For α_m equal to or less than 0.2, the provisions of Section 1909.5.3.2 shall apply.

2. For α_m greater than 0.2 but not greater than 2.0, the thickness shall not be less than

$$h = \frac{l_n\left(0.8 + \frac{f_y}{200{,}000}\right)}{36 + 5\beta(\alpha_m - 0.2)} \qquad (9\text{-}11)$$

For SI:

$$h = \frac{l_n\left(0.8 + \frac{f_y}{1370}\right)}{36 + 5\beta(\alpha_m - 0.2)}$$

but not less than 5 inches (127 mm).

3. For α_m greater than 2.0, the thickness shall not be less than

$$h = \frac{l_n\left(0.8 + \frac{f_y}{200{,}000}\right)}{36 + 9\beta} \qquad (9\text{-}12)$$

For SI:

$$h = \frac{l_n\left(0.8 + \frac{f_y}{1370}\right)}{36 + 9\beta}$$

but not less than 3.5 inches (89 mm).

4. At discontinuous edges, an edge beam shall be provided with a stiffness ratio α not less than 0.80; or the minimum thickness required by Formula (9-11) or (9-12) shall be increased by at least 10 percent in the panel with a discontinuous edge.

1909.5.3.4 Slab thickness less than the minimum thickness required by Section 1909.5.3.1, 1909.5.3.2 and 1909.5.3.3 may be used if shown by computation that the deflection will not exceed the limits stipulated in Table 19-C-1. Deflections shall be computed taking into account size and shape of the panel, conditions of support, and nature of restraints at the panel edges. The modulus of elasticity of concrete E_c shall be as specified in Section 1908.5.1. The effective moment of inertia shall be that given by Formula (9-7); other values may be used if they result in computed deflections in reasonable agreement with the results of comprehensive tests. Additional long-term deflection shall be computed in accordance with Section 1909.5.2.5.

1909.5.4 Prestressed concrete construction.

1909.5.4.1 For flexural members designed in accordance with provisions of Section 1918, immediate deflection shall be computed by usual methods or formulas for elastic deflections, and the moment of inertia of the gross concrete section may be used for uncracked sections.

1909.5.4.2 Additional long-time deflection of prestressed concrete members shall be computed taking into account stresses in concrete and steel under sustained load and including effects of creep and shrinkage of concrete and relaxation of steel.

Deflection computed in accordance with this section shall not exceed limits stipulated in Table 19-I.

1909.5.5 Composite construction.

1909.5.5.1 Shored Construction. If composite flexural members are supported during construction so that, after removal of temporary supports, dead load is resisted by the full composite section, the composite member may be considered equivalent to a monolithically cast member for computation of deflection. For nonprestressed members, the portion of the member in compression shall determine whether values in Table 19-C-1 for normal-weight or lightweight concrete shall apply. If deflection is computed, account should be taken of curvatures resulting from differential shrinkage of precast and cast-in-place components, and of axial creep effects in a prestressed concrete member.

1909.5.5.2 Unshored construction. If the thickness of a nonprestressed precast flexural member meets the requirements of Table 19-C-1, deflection need not be computed. If the thickness of a nonprestressed composite member meets the requirements of Table 19-D, deflection occurring after the member becomes composite need not be computed, but the long-time deflection of the precast member should be investigated for magnitude and duration of load prior to beginning of effective composite action.

1909.5.5.3 Deflection computed in accordance with this section shall not exceed limits stipulated in *Table 19-I.*

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-1909, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2200 Chapter 22—Steel.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2200, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2211 Section 2211—Steel structures resisting forces induced by earthquake motions in seismic zones 3 and 4.

2211.1 General. Design and construction of steel framing in lateral-force-resisting systems in Seismic Zones 3 and 4 shall conform to the requirements of the code and to the requirements of this section.

2211.2 Definitions.

ALLOWABLE STRESSES are prescribed in Divisions V and IX.

CHEVRON BRACING is that form of bracing where a pair of braces located either above or below a beam terminates at a single point within the clear beam span.

CONNECTION is the group of elements that connect the member to the joint.

DIAGONAL BRACING is that form of bracing that diagonally connect joints at different levels.

ECCENTRICALLY BRACED FRAME (EBF) is a diagonal braced frame in which at least one end of each bracing member connects to a beam a short distance from a beam-to-column connection or from another beam-to-brace connection.

GIRDER is the horizontal member in a seismic frame. The words beam and girder may be used interchangeably.

JOINT is the entire assemblage at the intersections of the members.

K BRACING is that form of bracing where a pair of braces located on one side of a column terminates at a single point within the clear column height.

LINK BEAM is that part of a beam in an eccentrically braced frame which is designed to yield in shear and/or bending so that buckling of the bracing members is prevented.

STRENGTH is the strength as prescribed in Section 2211.4.2.

V BRACING is that form of chevron bracing that intersects a beam from above and inverted V bracing is that form of chevron bracing that intersects a beam from below.

X BRACING is that form of bracing where a pair of diagonal braces cross near midlength of the bracing members.

2211.3 Symbols and Notations. The symbols and notations unique to this section are as follows:

M_s = flexural strength.
P_{DL} = axial dead load.
P_E = axial load on member due to earthquake.
P_{LL} = axial live load.
P_{sc} = compressive axial strength of member.
P_{st} = tensile axial strength of member.
V_s = shear strength of member.
Z = plastic section modulus.

2211.4 Materials.

2211.4.1 Quality. Structural steel used in lateral-force-resisting systems shall conform to A 36, A 500, A 501, A 572 (Grades 42 and 50) and A 588. Structural steel conforming to A 283 (Grade D) may be used for base plates and anchor bolts.

EXCEPTION: Other steels permitted in this code may be used for the following:
1. One-story buildings.
2. Light-framed wall systems in accordance with Section 2211.10.

2211.4.2 Member Strength. Where this section requires that the strength of the member be developed, the following shall be used:

	Strength
Flexure	$M_s = ZF_y$
Shear	$V_s = 0.55\ F_y dt$
Axial compression	$P_{sc} = 1.7\ F_a A$
Axial tension	$P_{st} = F_y A$
Connectors	
Full-penetration welds	$F_y A$
Partial penetration welds	1.7 allowable
Bolts and fillet welds	1.7 allowable

Members need not be compact unless otherwise required by this section.

2211.5 Column Requirements.

2211.5.1 Column strength. Columns shall satisfy the load combinations required by Section 603.6 at allowable stress limits, with stress increases allowed by Section 1603.5. In addition, in Seismic Zones 3 and 4, columns in frames shall have the strength to resist the axial loads resulting from the load combinations in Items 1 and 2 following.

1. **Axial compression**

$$1.0\ P_{DL} + 0.7\ P_{LL} + 3(R_w/8)P_E$$

2. **Axial tension**

$$0.85\ P_{DL} \pm 3(R_w/8)P_E$$

EXCEPTION: The axial load combination as outlined in Items 1 and 2 above:
1. Need not exceed either the maximum force that can be transferred to the column, by elements of the structure, or the limit as determined by the overturning uplift which the foundation is capable of resisting.
2. Need not apply to columns in moment-resisting frames complying with Formula (11-3.1) or (11-3.2) where f_a is equal to or less than 0.3 F_y for all load combinations.

The load combinations from Items 1 and 2 need be used only when specifically referred to.

2211.5.2 Column splices. Column splices shall have sufficient strength to develop the column forces determined from Section 2211.5.1. Welded column splices subject to net tensile forces shall comply with the more critical of the following:

1. Partial penetration welds shall be designed to resist 150 percent of the force determined from Section 2211.5.1, Item 2.

2. Welding shall develop not less than 50 percent of the flange area strength of the smaller column.

Splices employing partial penetration welds shall be located at least three feet (914 mm) from girder flanges.

2211.5.3 Slenderness evaluation. This paragraph is applicable when the provisions are applied to the effective length determination of columns of moment frames resisting earthquake forces. In the plane of the earthquake forces the factor K may be taken as unity when all of the following conditions are met:

1. The column is either continuous or is fixed at each joint.

2. The maximum axial compressive stress, f_a, does not exceed 0.4 F_y under design loads.

3. The calculated story drift ratios are less than the values given in Section 1628.8.

2211.6 Ordinary Moment Frame Requirements. Ordinary moment frames (OMF) shall be designed to resist the load combinations in Section 1603.6.

All beam-to-column connections in OMFs which resist earthquake forces shall meet one of the following requirements:

1. Fully restrained (Type F.R. or Type 1) conforming with Section 2211.7.1.

2. Fully restrained (Type F.R. or Type 1) connections with the design strengths of the connections capable of resisting a combination of gravity loads and $3(R_w/8)$ times the design seismic forces.

3. Partially restrained (Type P.R. or Type 3) connections are permitted provided:

3.1 The connections are designed to resist the load combinations in Section 1603.6, and

3.2 The connections have been demonstrated by cyclic tests to have adequate rotation capacity to accommodate a story drift due to $3(R_w/8)$ times the design seismic forces.

3.3 The moment frame drift calculations shall include the contribution due to the rotation and distortion of the connection.

See Divisions VIII and IX for definitions of fully restrained and partially restrained connections.

2211.7 Special Moment-resisting Frame (SMRF) Requirements.

2211.7.1 Girder-to-column connection.

2211.7.1.1 Required strength. The girder-to-column connection shall be adequate to develop the lesser of the following:

1. The strength of the girder in flexure.

2. The moment corresponding to development of the panel zone shear strength as determined from Formula (11-1).

EXCEPTION: Where a connection is not designed to contribute flexural resistance at the joint, it need not develop the required strength if it can be shown to meet the deformation compatibility requirements of Section 1631.2.4.

2211.7.1.3 Connection strength. Connection configurations utilizing welds or high-strength bolts shall demonstrate, by approved cyclic test results or calculation, the ability to sustain inelastic rotation and develop the strength criteria in Section 2211.7.1.1 considering the effect of steel overstrength and strain hardening.

2211.7.1.3 Flange detail limitations. For steel whose specified ultimate strength is less than 1.5 times the specified yield strength, plastic hinges shall not form at locations in which the beam flange area has been reduced, such as for bolt holes. Bolted connections of flange plates of beam-column joints shall have the net-to-gross area ratio A_f/A_g equal to or greater than 1.2 F_y/F_u.

2211.7.2 Panel zone.

2211.7.2.1 Strength. The panel zone of the joint shall be capable of resisting the shear induced by beam bending moments due to gravity loads plus 1.85 times the prescribed seismic forces, but the shear strength need not exceed that required to develop $0.8\sum M_c$ of the girders framing into the column flanges at the joint. The joint panel zone shear strength may be obtained from the following formula:

$$V = 0.55\, F_y d_c t \left[1 + \frac{3 b_c t_{cf}^2}{d_b d_c t}\right] \qquad (11\text{-}1)$$

WHERE:

b_c = the width of the column flange.
d_b = the depth of the beam.
d_c = the column depth.
t = the total thickness of the joint panel zone including doubler plates.
t_{cf} = the thickness of the column flange.

2211.7.2.2 Thickness. The panel zone thickness, t_z, shall conform to the following formula:

$$t_z \geq (d_z + w_z)/90 \qquad (11\text{-}2)$$

WHERE:

d_z = the panel zone depth between continuity plates.
w_z = the panel zone width between column flanges.

For this purpose, t_z, shall not include any double plate thickness unless the doubler plate is connected to the column web with plug welds adequate to prevent local buckling of the plate.

2211.7.2.3 Doubler plates. Doubler plates provided to reduce panel zone shear stress or to reduce the web depth thickness ratio shall be placed not more than 1/16 inch (1.6 mm) from the column web and shall be welded across the plate width top and bottom with at least a 3/16-inch (4.7 mm) fillet weld. They shall be either butt or fillet welded to the column flanges to develop the shear strength of the doubler plate. Weld strength shall be as given in Section 2211.4.2.

2211.7.3 Width-thickness ratio. Girders shall comply with Division IX, except that the flange width-thickness ratio, $b/2t_f$, shall not exceed $52/\sqrt{F_y}$ (For **SI:** $0.31\sqrt{E/F_y}$). The width-thickness ratio of the column sections shall meet the requirements of Division IX, Section 2251N7. The outside wall width-thickness ratio of rectangular tubes used for columns shall not exceed $110/\sqrt{F_y}$ (For **SI:** $0.65\sqrt{E/F_y}$), unless otherwise stiffened.

2211.7.4 Continuity plates. When determining the need for girder tension flange continuity plates, the value of P_{bf} in Division IX shall be taken as $1.8\,(bt_f)F_{yb}$.

2211.7.5 Strength ratio. At any moment frame joint, the following relationships shall be satisfied:

$$\Sigma Z_c\,(F_{yc} - f_a)/\Sigma Z_b F_{yb} > 1.0 \qquad (11\text{-}3.1)$$

or

$$\Sigma Z_c\,(F_{yc} - f_a)/1.25\Sigma M_{pc} > 1.0 \qquad (11\text{-}3.2)$$

WHERE:

$f_a > 0$
M_{pc} = the sum of beam moments when panel zone shear strength reaches the value specified in Formula (11-1).

EXCEPTION: Columns meeting the compactness limitations for beams given in Section 2211.7.3 need not comply with this requirement provided they conform to one of the following conditions:

1. Columns with f_a less than 0.4 F_y for all load combinations other than loads specified in Section 2211.5.1, and
1.1 Which are used in the top story of a multistory building with building period greater than 0.7 second; or
1.2 Where the sum of their resistance is less than 20 percent of the shear in a story, and is less than 33 percent of the shear on each of the column lines within that story. A column line is defined for the purpose of this exception as a single line of columns, or parallel lines of columns located within 10 percent of the plan dimension perpendicular to the line of columns; or
1.3 When the design for combined axial compression and bending is proportioned to satisfy Division IX without the one-third permissible stress increase.
2. Columns in any story which have lateral shear strength 50 percent greater than that of the story above.
3. Columns which lateral shear strengths are not included in the design to resist code-required shears.

2211.7.6 Trusses in SMRF. Trusses may be used as horizontal members in SMRF if the sum of the truss seismic

force flexural strength exceeds the sum of the column seismic force flexural strength immediately above and below the truss by a factor of at least 1.25. For this determination the strengths of the members shall be reduced by the gravity load effects. In buildings of more than one story, the column axial stress shall not exceed $0.4F_y$ and the ratio of the unbraced column height to the least radius of gyration shall not exceed 60. Columns shall have allowable stresses reduced 25 percent when one end frames into a truss, and 50 percent when both ends frame into trusses. The connection of the truss chords to the column shall develop the lesser of the following:

1. The strength of the truss chord.

2. The chord force necessary to develop 125 percent of the flexural strength of the column.

2211.7.7 Girder-column joint restraint.

2211.7.7.1 Restrained joint. Where it can be shown that the columns of SMRF remain elastic, the flanges of the columns need to be laterally supported only at the level of the girder top flange.

Columns may be assumed to remain elastic if one of the following conditions is satisfied:

1. The ratio in Formula (11-3.1) or (11-3.2) is greater than 1.25.

2. The flexural strength of the column is at least 1.25 times the moment that corresponds to the panel zone shear strength.

3. Girder flexural strength or panel zone strength will limit column stress ($f_a + f_{bx} + f_{by}$) to F_y of the column.

4. The column will remain elastic under gravity loads plus $3(R_w/8)$ times the prescribed seismic forces.

Where the column cannot be shown to remain elastic, the column flanges shall be laterally supported at the levels of the girder top and bottom flanges. The column flange lateral support shall be capable of resisting a force equal to one percent of the girder flange capacity at allowable stresses and at a limiting displacement perpendicular to the frame of 0.2 inch (5.1 mm). Required bracing members may brace the column flanges directly or indirectly through the column web or the girder flanges.

2211.7.7.2 Unrestrained joint. Columns without lateral support transverse to a joint shall conform to the requirements of Division IX, with the column considered as pin ended and the length taken as the distance between lateral supports conforming with Section 2211.7.7.1 above. The column stress, f_a, shall be determined from gravity loads plus the lesser of the following:

1. $3(R_w/8)$ times the prescribed seismic forces.

2. The forces corresponding to either 125 percent of the girder flexural strength or the panel zone shear strength.

The stress, f_{by}, shall include the effects of the bracing force specified in Section 2211.7.7.1 and PΔ effects.

l/r for such columns shall not exceed 60.

At truss frames the column shall be braced at each truss chord for a lateral force equal to one percent of the compression yield strength of the chord.

2211.7.8 Beam bracing. Both flanges of beams shall be braced directly or indirectly. The beam bracing between column center lines shall not exceed 96 r_y. In addition, braces shall be placed at concentrated loads where a hinge may form.

2211.7.9 Changes in beam flange area. Abrupt changes in beam flange area are not permitted within possible plastic hinge regions of special moment-resistant frames.

2211.7.10 Moment frame drift calculations. Moment frame drift calculations shall include bending and shear contributions from the clear girder and column spans, column axial deformation and the rotation and distortion of the panel zone.

EXCEPTIONS: 1. Drift calculations may be based on column and girder center lines where either of the following conditions is met:
1.1 It can be demonstrated that the drift so computed for frames of similar configuration is typically within 15 percent of that determined above.
1.2 The column panel zone strength can develop 0.8 ΣM_s of girders framing to the column flanges at the joint.
2. Column axial deformations may be neglected if they contribute less than 10 percent to the total drift.

2211.8 Requirements for Braced Frames.

2211.8.1 General. The provisions of this section apply to all braced frames except special concentrically braced frames designed in accordance with Section 2211.9 or eccentrically braced frames (EBF) designed in accordance with Section 2211.10. Those members which resist seismic forces totally or partially by shear or flexure shall be designed in accordance with Section 2211.7 except Section 2211.7.3.

2211.8.2 Bracing members.

2211.8.2.1 Slenderness. In Seismic Zones 3 and 4, the l/r ratio for bracing members shall not exceed $720/\sqrt{F_y}$ (For **SI:** $4.23\sqrt{E/F_y}$), except as permitted in Sections 2211.8.5 and 2211.8.6.

2211.8.2.2 Stress reduction. The allowable stress, F_{as}, for bracing members resisting seismic forces in compression shall be determined from the following formula:

$$F_{as} = BF_a \qquad (11\text{-}4)$$

WHERE:

B = the stress-reduction factor determined from the following formula:

$$B = 1/[1 + \{(Kl/r)/2C_c\}] \qquad (11\text{-}5)$$

F_a = the allowable axial compressive stress allowed in Division IX.

EXCEPTION: Bracing members carrying gravity loads may be designed using the column strength requirement and load combinations of Section 2211.5.1, Item 1.

2211.8.2.3 Lateral-force distribution. The seismic lateral force along any line of bracing shall be distributed to the various members so that neither the sum of the horizontal components of the forces in members acting in tension nor the sum of the horizontal components of forces in members acting in compression exceed 70 percent of the total force.

EXCEPTION: Where compression bracing acting alone has the strength, neglecting the strength-reduction factor B, to resist $3(R_w/8)$

times the prescribed seismic force such distribution is not required.

A line of bracing is defined, for the purpose of this provision, as a single line or parallel lines within 10 percent of the dimension of the structure perpendicular to the line of bracing.

2211.8.2.4 Built-up members. The *l/r* of individual parts of built-up bracing members between stitches, when computed about a line perpendicular to the axis through the parts, shall not be greater than 75 percent of the *l/r* of the member as a whole.

2211.8.2.5 Compression elements in braces. The width-thickness ratio of stiffened and unstiffened compression elements used in braces shall be as shown in Division IX.

2211.8.3 Bracing connection.

2211.8.3.1 Forces. Bracing connections shall have the strength to resist the least of the following:

1. The strength of the bracing in axial tension, P_{at}.

2. $3(R_w/8)$ times the force in the brace due to the prescribed seismic forces, in combination with gravity loads.

3. The maximum force that can be transferred to the brace by the system.

Bracing connections shall, as a minimum, satisfy the load combinations required by Section 1603.6 at allowable stress limits, with stress increases allowed by Section 1603.5. These combinations shall include the provisions for Section 2211.8.2.2 and 2211.8.4.1.

Beam-to-column connections for beams that are part of the bracing system shall have the capacity to transfer the force determined above. Where eccentricities in the frame geometry or connection load path exist, the affected members and connections shall have the strength to resist all secondary forces resulting from the eccentricities in combination with all primary forces using the lesser of the forces determined above.

2211.8.3.2 Net area. In bolted brace connections, the ratio of effective net section area to gross section area shall satisfy the formula:

$$\frac{A_e}{A_g} \geq \frac{1.2\,\alpha F^*}{F_u} \qquad (11\text{-}6)$$

WHERE:

A_e = effective net area as defined in Division IX.
F_u = minimum tensile strength.
F^* = stress in brace as determined in Section 2211.8.3.1.
α = fraction of the member force from Section 2211.8.3.1 that is transferred across a particular net section.

2211.8.4 Bracing configuration.

2211.8.4.1 Chevron bracing. Chevron bracing shall conform with the following:

1. Bracing members shall be designed for 1.5 times the otherwise prescribed seismic forces, in addition to the requirements of Section 2211.8.2.2.

2. The beam intersected by chevron braces shall be continuous between columns.

3. Where chevron braces intersect a beam from below, i.e., inverted V brace, the beam shall be capable of supporting all tributary gravity loads presuming the bracing not to exist.

EXCEPTION: This limitation need not apply to penthouses, one-story buildings or the top story of buildings.

2211.8.4.2 K bracing. K bracing is prohibited except as permitted in Section 2211.8.5.

2211.8.4.3 Nonconcentric bracing. Nonconcentric bracing shall conform with the following:

1. Any member intersected by the brace shall be continuous through the connection.

2. When the eccentricity of the brace is greater than the depth of the intersected member at the eccentric location, the affected member shall have the strength to resist the forces prescribed in Section 2211.8.3.1, including the effects of all secondary forces resulting from the eccentricities.

2211.8.5 One- and two-story buildings. Braced frames not meeting the requirements of Sections 2211.8.2 and 2211.8.4 may be used in buildings not over two stories in height and in roof structures as defined in Chapter 15 if the braces have the strength to resist $3(R_w/8)$ times the code equivalent static forces.

2211.8.6 Nonbuilding structures. Nonbuilding structures with R_w values defined by Table 16-P need comply only with the provisions of Section 2211.8.3.

2211.9 Requirements for Special Concentrically Braced Frames.

2211.9.1 General. The provisions of this section apply to special concentrically braced frame structures as defined in Section 1625. All members and connections in special braced frames shall be designed and detailed to resist shear and flexure caused by eccentricities in the geometry of the members comprising the frame in accordance with Section 2211.9. Any member intersected by a brace shall be continuous through the connection. Horizontal bracing that transfers forces between horizontally offset bracing in the vertical plane shall be subject to the requirements of Section 2211.9, except Sections 2211.9.2.3; 2211.9.4.1, Item 3; and 2211.9.4.2. Horizontal bracing other than the above is not subjected to the requirements of Section 2211.9.

2211.9.2 Bracing members.

2211.9.2.1 Slenderness. The *kl/r* ratio for bracing members shall not exceed $1{,}000/\sqrt{F_y}$ (For **SI:** $5.87\sqrt{E/F_y}$), except as permitted in Section 2211.9.6.

2211.9.2.2 Lateral-force distribution. The seismic lateral force along any line of bracing shall be distributed to the various members so that neither the sum of the horizontal components of forces in members acting in compression or tension exceed 70 percent of the total force.

EXCEPTION: Where compression bracing acting alone has the strength to resist $3(R_w/8)$ times the prescribed seismic force, such distribution is not required.

A line of bracing is defined, for the purposes of this provision, as a single line or parallel lines within 10 percent

of the dimension of the structure perpendicular to the line of bracing.

2211.9.2.3 Built-up members. The spacing of stitches shall be such that the slenderness ratio (l/r) of individual elements between the stitches does not exceed 0.4 times the governing slenderness ratio of the built-up member. The total shear strength of the stitches shall be at least equal to the tensile strength of each element. The spacing of the stitches shall be uniform and not less than two stitches shall be used. Bolted stitches shall not be located within the middle one fourth of the clear brace length.

EXCEPTION: Where it can be shown that braces can buckle without causing shear in the stitches, the spacing of the stitches shall be such that the slenderness ratio (l/r) of the individual element between the stitches does not exceed 0.75 times the governing slenderness ratio of the built-up member.

2211.9.2.4 Compression elements in braces. The width-thickness ratio of compression elements used in braces shall meet the requirements of Division IX, Table B5.1, for compact sections. The width-thickness ratio of angle section shall be limited to $52/\sqrt{F_y}$ (For **SI:** $0.31\sqrt{E/F_y}$). Circular sections shall have outside diameter-wall thickness ratio not exceeding $1{,}300/F_y$ (For **SI:** $7.63\ E/F_y$), rectangular tubes shall have outside wall width-thickness ratio not exceeding $110/\sqrt{F_y}$ (For **SI:** $0.65\sqrt{E/F_y}$).

EXCEPTION: Compression elements stiffened to resist local buckling.

2211.9.3 Bracing connections.

2211.9.3.1 Forces. Bracing connections shall have the strength to resist the lesser of the following:

1. The strength of the brace in axial tension, P_u.

2. $3(R_w/8)$ times the force in the brace due to the prescribed seismic forces, in combination with gravity loads.

3. The maximum force that can be transferred to the brace by the system.

Bracing connection shall, as a minimum, satisfy the load combinations required by Section 1603.6 at allowable stress limits with stress increases allowed by Section 1603.5. Beam-to-column connections for beams that are part of the bracing system shall have the capacity to transfer the force determined above. Where eccentricities in the frame geometry or connection load path exist, the affected members and connections shall have the strength to resist all secondary forces resulting from the eccentricities in combination with all primary forces using the lesser of the forces determined above.

2211.9.3.2 Net area. In bolted brace connections, the ratio of effective net section area to gross section shall satisfy Formula (11-6) of Section 2211.8.3.2.

2211.9.3.3 Gusset plates. End connections of braces shall provide a flexural strength in excess of that of the brace gross section about the critical buckling axis.

EXCEPTION: Where the out-of-plane buckling strength of the brace is less than the in-plane buckling strength and the brace terminates on a single gusset plate connection with a setback of two times the gusset thickness from a line about which the gusset plate may bend unrestrained by the column or beam joints, and the gusset plate shall be designed to carry the compressive strength of the brace without buckling.

2211.9.4 Bracing configuration.

2211.9.4.1 Chevron bracing. Chevron bracing shall conform with the following:

1. The beam intersected by chevron braces shall be continuous between columns.

2. Where chevron braces intersect a beam from below, i.e., inverted V brace, the beam shall be capable of supporting all tributary gravity loads presuming the bracing not to exist.

3. A beam intersected by chevron braces shall have the strength to support the following tributary gravity loads and unbalanced brace force combinations:

$$1.2D + 0.5L + P_b$$
$$0.9D - P_b$$

WHERE:

D = tributary dead load.

L = tributary live load.

P_b = the maximum unbalanced post-buckling force that can be applied to the beam by the braces. For this purpose, the maximum unbalanced force may be computed using a minimum of P_{st} for the tension and a maximum of 0.3 P_{sc} for the compression brace.

4. Both flanges of beams at the point of intersection of chevron braces shall be laterally supported directly or indirectly.

EXCEPTION: Limitations 2 and 3 need not apply to penthouses, one-story buildings or the top story of buildings.

2211.9.4.2 K bracing. K bracing is prohibited.

2211.9.5 Columns. Columns in braced frames shall meet the requirements of Section 2211.7.3. In addition to meeting the requirements of Sections 2211.5.1 and 2211.5.2, column splices shall be designed to develop the full shear strength and 50 percent of the full moment strength of the section. Splices shall be located in the middle one third of the column clear height.

2211.9.6 Nonbuilding structures. Nonbuilding structures with R_w values defined by Table 16-P need comply only with the provisions of Sections 2211.9.3.1 and 2211.9.3.2.

2211.10 Eccentrically Braced Frame (EBF) Requirements.

2211.10.1 General. Eccentrically braced frames shall be designed in accordance with this section.

2211.10.2 Link beam. There shall be a link beam provided at least at one end of each brace. Beams in EBFs shall comply with the requirements of Division IX, except that the flange width-thickness ratio $b_f/2t_f$ shall not exceed $52/\sqrt{F_y}$.

2211.10.3 Link beam strength. Link beam shear strength, V_s, and flexural strength, M_s, are the strengths as defined in Section 2211.4.2. Where link beam strength is governed by shear, the flexural and axial capacities within the link shall be calculated using the beam flanges only.

A reduced flexural strength, M_{rs}, for use in Sections 2211.10.8 and 2211.10.13 is defined as $Z(F_y - f_a)$. Where f_a is less than $0.15F_y$, f_a may be neglected.

2211.10.4 Link beam rotation. The rotation of the link segment relative to the rest of the beam, at a total frame drift

of $3(R_w/8)$ times the drift determined for prescribed seismic forces, shall not exceed the following:

1. 0.060 radians for link segments having clear lengths of 1.6 M/V, or less.

2. 0.015 radians for link segments having clear lengths of 3.0 M/V, or greater.

3. A value obtained by linear interpolation for clear lengths between the above limits.

2211.10.5 Link beam web. The web of the link beam shall be single thickness without doubler plate reinforcement. No openings shall be placed in the web of a link beam. The web shear shall not exceed $0.8V$, under prescribed lateral forces.

2211.10.6 Beam connection braces. Brace-to-beam connections shall develop the compression strength of the brace and transfer this force to the beam web. No part of the brace-to-beam connection shall extend into the web area of a link beam.

2211.10.7 Link beam stiffeners. Link beams shall have full-depth web stiffeners on both sides of the beam web at the brace end of the link beam. In addition, for link beams with clear lengths within the limits in Section 2211.10.4, Item 3, full-depth stiffeners shall be placed at a distance b_f from each end of the link. The stiffeners shall have a combined width not less than $b - 2t_w$ and a thickness not less than 0.75 t_w or less than 3/8 inch (9.5 mm).

2211.10.8 Intermediate stiffeners. Intermediate full-depth web stiffeners shall be provided in either of the following conditions:

1. Where the link beam strength is controlled by V_n.

2. Where the link beam strength is controlled by flexure and the shear determined by applying the reduced flexural strength, M_{nn}, exceeds $0.45\ F_y dt$.

2211.10.9 Web stiffener spacing. Where intermediate web stiffeners are required, the spacing shall conform to the requirements given below.

1. For link beams with rotation angle of 0.06 radians, the spacing shall not exceed $38t_w - d/5$.

2. For link beams with a rotation angle of 0.03 radians or less, the spacing shall not exceed $56t_w - d/5$. Interpolation may be used for rotation angles between 0.03 and 0.06 radians.

2211.10.10 Web stiffener location. For beams 24 inches (610 mm) in depth and greater, intermediate full-depth web stiffeners are required on both sides of the web. Such web stiffeners are required only on one side of the beam web for beams less than 24 inches (610 mm) in depth. The stiffener thickness, t_w, of one side stiffeners shall not be less than 3/8 inch (9.5 mm) and the width shall not be less than $(b_f/2) - t_w$.

2211.10.11 Stiffener welds. Fillet welds connecting the stiffener to the beam web shall develop a stiffener force of $A_{nn}F_y$. Fillet welds connecting the stiffener to the flanges shall develop a stiffener force of $A_{nn}F_y/4$.

A_{st} = bt of stiffener.
b = width of stiffener plate.

2211.10.12 Link beam-column connections. Length of link beam connected to columns shall not exceed $1.6\ M/V_n$.

1. Where a link beam is connected to the column flange, the following requirements shall be met:

1.1 The beam flanges shall have full-penetration welds to the column.

1.2 Where the link beam strength is controlled by shear in conformance with Section 2211.10.8, the web connection shall be welded to develop the full link beam web shear strength.

2. Where the link beam is connected to the column web, the beam flanges shall have full-penetration welds to the connection plates and the web connection shall be welded to develop the link beam web shear strength. Rotation between the link beam and the column shall not exceed 0.015 radians at $3(R_w/8)$ times the drift due to the prescribed seismic forces.

2211.10.13 Brace and beam strengths. The controlling link beam strength is either the shear strength, V_n, or the reduced flexural strength, M_{nn}, whichever results in the lesser axial force in the brace.

Each brace and beam outside the link shall have axial strength at least 1.5 times the force corresponding to the controlling link beam strength. Each brace and beam outside the link shall have combined reduced flexural strength, M_{nn}, at least 1.0 times the force corresponding to the controlling link beam strength.

2211.10.14 Column strength. Columns shall be designed to remain elastic at 1.25 times the strength of the EBF bay, as defined in Section 2211.10.13 above. Column strength need not exceed the requirements of Section 2211.5.

2211.10.15 Roof link beam. A link beam is not required in roof beams for EBF over five stories.

2211.10.16 Concentric brace in combination. The first story of an EBF bay over five stories in height may be concentrically braced if this story can be shown to have an elastic capacity 50 percent greater than the yield capacity of the story frames above the first story.

2211.10.17 Axial forces. Axial forces in beams of EBF frames due to braces and due to transfer of seismic force to the end of the frames shall be included in the frame calculations.

2211.10.18 Beam flanges. Top and bottom flanges of EBF beams shall be laterally braced at the ends of link beams and at intervals not exceeding $76/\sqrt{F_y}$ (For **SI:** $0.45\sqrt{E/F_y}$) times the beam flange width. End bracing shall be designed to resist 6.0 percent of the beam flange strength, defined as $F_y b_f t_f$. Intermediate bracing shall be designed to resist 1.0 percent of the beam flange force at the brace point using the link beam strength determined in Section 2211.10.13.

2211.10.19 Beam-column connection. Beam connections to columns may be designed as pins in the plane of the beam web if the link beam is not adjacent to the column. Such connection shall have the capacity to resist a torsional moment of 0.01 $F_y b_f t_f d$.

2211.11 Stud Wall Systems. Stud wall systems may be used to resist the specified seismic forces in buildings not over five stories in height. Such systems shall comply with the following:

1. The l/r of the brace may exceed 200 and is unlimited.

2. All boundary members, chords and collectors shall be designed and detailed to transmit the induced axial forces.

3. Connection of the diagonal bracing member, top chord splices, boundary members and collectors shall be designed to develop the full tensile strength of the member or $3(R_w/8)$ times the otherwise prescribed seismic forces.

4. Vertical and diagonal members of the braced bay shall be anchored so the bottom track is not required to resist uplift forces by bending of the track web.

5. Both flanges of studs in a bracing panel shall be braced to prevent lateral torsional buckling. Wire tied bridging shall not be considered to provide such restraint.

6. Screws shall not be used to resist lateral forces by pullout resistance.

7. Provision shall be made for pretensioning or other methods of installation of tension-only bracing to guard against loose diagonal straps.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2211, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2400 Chapter 24—Glass and glazing.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2400, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2406 Section 2406—Safety glazing.

2406.1 General. Glazing subject to human impact shall comply with this section.

2406.2 Identification. Each light of safety glazing material installed in hazardous locations as defined in Section 2406.4 shall be identified by a permanent label which specifies the labeler, whether the manufacturer or installer, and state that safety glazing material has been utilized in such installation. For additional identification requirements and for limitations on size and use by category classification, see U.B.C. Standard 24-2, Part I.

Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed. Tempered spandrel glass is exempted from permanent labeling but such glass shall be identified by the manufacturer with a removable paper label.

2406.3 Human Impact Loads. Individual glazed areas in hazardous locations such as those indicated in Section 2406.4, including glazing used in fire assemblies in accordance with Section 713, shall pass the test requirements of Part I of U.B.C. Standard 24-2.

EXCEPTIONS: 1. Louvered windows and jalousies complying with Section 2405 need not comply with Section 2406.3.
2. Polished wire glass complying with Part II of U.B.C. Standard 24-2 may be used in fire-rated assemblies and in locations specified in Items 6 and 7 of Section 2406.4.

Plastic glazing used in exterior applications also shall comply with the weathering requirements in Part II of U.B.C. Standard 24-2.

2406.4 Hazardous Locations. The following shall be considered specific hazardous locations for the purpose of glazing:

1. Glazing in ingress and egress doors except jalousies.

2. Glazing in fixed and sliding panels of sliding door assemblies and panels in swinging doors other than wardrobe doors.

3. Glazing in storm doors.

4. Glazing in all unframed swinging doors.

5. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any portion of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches (1525 mm) above a standing surface and drain inlet.

6. Glazing in fixed or operable panels adjacent to a door where the nearest exposed edge of the glazing is within a 24-inch (610 mm) arc of either vertical edge of the door in a closed position and where the bottom edge of the glazing is less than 60 inches (1525 mm) above the walking surface.

7. Glazing in an individual fixed or operable panel, other than those locations described in Items 5 and 6 above, that meets all of the following conditions:

7.1 Exposed area of an individual pane greater than 9 square feet (0.84 m^2).

7.2 Exposed bottom edge less than 18 inches (457 mm) above the floor.

7.3 Exposed top edge greater than 36 inches (914 mm) above the floor.

7.4 One or more walking surfaces within 36 inches (914 mm) horizontally of the plane of the glazing.

8. Glazing in railings regardless of height above a walking surface. Included are structural baluster panels and nonstructural in-fill panels.

EXCEPTION: The following products and applications are exempt from the requirements for hazardous locations as listed in Items 1 through 8 above:
1. Glazing in Item 6 when there is an intervening wall or other permanent barrier between the door and the glazing.
2. Glazing in Item 7 when a protective bar is installed on the accessible sides of the glazing 34 inches (864 mm) to 38 inches (965 mm) above the floor. The bar shall be capable of withstanding a horizontal load of 50 pounds per linear foot (729 N/m) without contacting the glass and be a minimum of 1½ inches (38.1 mm) in height.

3. Outboard pane in insulating glass units and in other multiple glazed panels in Item 7 when the bottom exposed edge of the glass is 25 feet (7620 mm) or more above any grade, roof, walking surface or other horizontal or sloped (within 45 degrees of horizontal) surface adjacent to the glass exterior.
4. Openings is doors through which a 3-inch-diameter (76.2 mm) sphere will not pass.
5. Assemblies of leaded, faceted or carved glass in Items 1, 2, 6 and 7 when used for decorative purposes.
6. Curved panels in revolving door assemblies.
7. Door in commercial refrigerated cabinets.
8. Glass block panels complying with Section 2110.

9. Glazing in walls and fences used as the barrier for indoor and outdoor swimming pools and spas when all of the conditions are present:

9.1 The bottom edge of the glazing is less than 60 inches (1525 mm) above the pool side of the glazing.

9.2 The glazing is within 5 feet (1525 mm) of a swimming pool or spa deck area.

10. Glazing in walls at stairway landings within the width of the stair and within 5 feet (1525 mm) beyond the bottom and top of flights of stairs, where the bottom edge of the glazing is less than 60 inches (1525 mm) above a walking surface.

2406.5 Wardrobe Doors. Glazing in wardrobe doors shall meet the impact test requirements for safety glazing as set forth in U.B.C. Standard 24-2, Part II. Laminated glass must also meet the boil test requirements of U.B.C. Standard 24-2, part II.

EXCEPTION: The impact test shall be modified so that if no breakage occurs when the impacting object is dropped from the height of 18 inches (457 mm), the test shall progress in height increments of 6 inches (152 mm) until the maximum of 48 inches (1219 mm) is reached.

2406.6 Glass Railings. Glass used as structural balustrade panels in railings shall be one of the following types:

1. Single fully tempered glass.
2. Laminated fully tempered glass.
3. Laminated heat-strengthened glass.

The panels and their support system shall be designed to withstand the load specified in Table 16-B. A safety factor of 4 shall be used.

Each handrail or guardrail section shall be supported by a minimum of three glass balusters or otherwise supported so that it remains in place should one baluster panel fail.

Glass balusters shall not be installed without a handrail or guardrail attached.

For all glazing types the minimum nominal thickness shall be 1/4 inch (6.35 mm).

Glazing materials shall not be installed in railings in parking garages except for those locations where the railing is not exposed to impact from vehicles.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2406, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2900 Chapter 29—Plumbing systems.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2900, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2902 Section 2902—Number of fixtures.

2902.1 General. The number of plumbing fixtures within a building shall not be less than set forth in Section 2902 and Table 29-A.

2902.2 Group A Occupancies. In Group A Occupancies at least one drinking fountain shall be provided at each floor level in an approved location.

EXCEPTION: A drinking fountain need not be provided in a drinking or dining establishment.

For other requirements on plumbing fixtures, see Sections 807, 2903, 2904, and Table 29-A.

2902.3 Group B, F, H, M and S Occupancies. In Groups B, F, H, M, and S Occupancies, buildings or portions thereof where persons are employed shall be provided with at least one water closet. Separate facilities shall be provided for each sex when the number of employees exceeds four. Such toilet facilities shall be located in such building or conveniently in a building adjacent thereto on the same property.

Such water closet rooms in connection with food establishments where food is prepared, stored or served shall have a nonabsorbent interior finish as specified in Section 807.1, shall have hand washing facilities therein or adjacent thereto, and shall be separated from food preparation or storage rooms as specified in Section 302.6.

For other requirements on plumbing fixtures, see Sections 807, 2903, 2904 and Table 29-A.

2902.4 Group E Occupancies. The number of plumbing fixtures within a building shall not be less than set forth in Table 29-A.

For other requirements on plumbing fixtures, see Sections 807, 2903 and 2904.

2902.5 Group I Occupancies. The number of plumbing fixtures within a building shall not be less than set forth in Table 29-A.

For other requirements on plumbing fixtures, see Sections 807, 2903 and 2904.

2902.6 Group R Occupancies. The number of plumbing fixtures within a building shall not be less than set forth in Table 29-A.

Dwelling units shall be provided with a kitchen equipped with a kitchen sink.

Each sink, lavatory and either a bathtub or shower shall be equipped with hot and cold running water necessary for its normal operation.

For other requirements on plumbing fixtures, see Section 807, 2903 and 2904.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2902, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2903 Section 2903—Accessibility.

For accessibility requirements for all plumbing fixtures see Chapter 11.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2903, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2904 Section 2904—Plumbing fixtures.

2904.1 Water closet space requirements. The water closet stool in all occupancies shall be located in a clear space not less than 30 inches (762 mm) in width. The clear space in front of the water closet stool shall not be less than 24 inches (610 mm).

2904.2 Drinking Fountains. Drinking fountains shall not be installed in toilet rooms.

2904.3 Finishes. See Section 807 for wall and floor finishes.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2904, filed 12/21/94, effective 6/30/95.]

WAC 51-30-2910 Table 29-A—Minimum plumbing fixtures.

TABLE 29-A -- MINIMUM PLUMBING FIXTURES [1,2,3,4,6]

TYPE OF BUILDING OR OCCUPANCY	WATER CLOSETS[3] (fixtures per person) MALE	FEMALE	LAVATORIES[5] (fixtures per person) MALE	FEMALE	BATHTUB OR SHOWER (fixtures per person)
For the occupancies listed below, use 30 square feet (2.79 m²) per occupant for the minimum number of plumbing fixtures.					
Group A Conference rooms, dining rooms, drinking establishments, exhibit rooms, gymnasiums, lounges, stages and similar uses including restaurants classified as Group B Occupancies	1:1-25 2:26-75 3:76-125 4:126-200 5:201-300 6:301-400 Over 400, add one fixture for each additional 200 males or 150 females.	1:1-25 2:26-75 3:76-125 4:126-200 5:201-300 6:301-400	one per 2 water closets		
For the assembly occupancies listed below, use the number of fixed seating or, where no fixed seating is provided, use 15 square feet (1.39 m²) per occupant for the minimum number of plumbing fixtures.					
Assembly places -- Theaters, auditoriums, convention halls, dance floors, lodge rooms, and casinos	1:1-100 2:101-200 3:201-400 Over 400 males, add one fixture for each additional 500, and over 400 females add one for each 50.	One per 25 up to 400	1:1-200 2:201-400 3:401-750 Over 750, add one fixture for each additional 500 persons.	1:1-200 2:201-400 3:401-750	

TABLE 29-A -- MINIMUM PLUMBING FIXTURES [1,2,3,4,6] (continued)

TYPE OF BUILDING OR OCCUPANCY	WATER CLOSETS[5] (fixtures per person) MALE	FEMALE	LAVATORIES[5] (fixtures per person) MALE	FEMALE	BATHTUB OR SHOWER (fixtures per person)
For the assembly occupancies listed below, use the number of fixed seating or, where no fixed seating is provided, use 15 square feet (1.39 m²) per occupant for the minimum number of plumbing fixtures.					
Group A Assembly places -- Stadiums, arena and sporting facilities	1:1-100 2:101-200 3:201-400 Over 400 males, add one fixture for each additional 500, and over 400 females add one for each 100.	One per 50 up to 400	1:1-200 2:201-400 3:401-750 Over 750, add one fixture for each additional 500 persons.	1:1-200 2:201-400 3:401-750	
For the assembly occupancies listed below, use the number of fixed seating or, where no fixed seating is provided, use 30 square feet (2.79 m²) per occupant for the minimum number of plumbing fixtures.					
Worship places Principal assembly area	one per 150	one per 75	one per 2 water closets		
Worship places Educational and activity unit	one per 125	one per 75	one per 2 water closets		
For the occupancies listed below, use 200 square feet (18.58 m²) per occupant for the minimum number of plumbing fixtures					
Group B	1:1-15 2:16-35 3:36-55 Over 55, add one for each 75 persons.	1:1-15 2:16-35 3:36-55	one per 2 water closets		

TABLE 29-A -- MINIMUM PLUMBING FIXTURES [1,2,3,4,6] (continued)

TYPE OF BUILDING OR OCCUPANCY	WATER CLOSETS[5] (fixtures per person) MALE	FEMALE	LAVATORIES[5] (fixtures per person) MALE	FEMALE	BATHTUB OR SHOWER (fixtures per person)
For the occupancies listed below, use 100 square feet (9.3 m²) per student for the minimum number of plumbing fixtures.					
Group E Schools -- for staff use All schools (One staff per 20 students)	1:1-15 2:16-35 3:36-55 Over 55, add one fixture for each additional 40 persons.	1:1-15 2:16-35 3:36-55	one per two water closets		
Schools -- for student use Day care	1:1-20 2:21-50 Over 50, add one fixture for each additional 50 persons.	1:1-20 2:21-50	1:1-20 2:21-50 Over 50, add one fixture for each additional 50 persons.	1:1-20 2:21-50	
Elementary	one per 30	one per 25	one per two water closets		
Secondary	one per 40	one per 30	one per two water closets		
For the occupancies listed below, use 50 square feet (4.65 m²) per occupant for the minimum number of plumbing fixtures.					
Education Facilities other than Group E Others (colleges, universities, adult centers, etc.)	one per 40	one per 25	one per two water closets		
For the occupancies listed below, use 2,000 square feet (185.8 m²) per occupant for the minimum number of plumbing fixtures.					
Group F Workshop, foundries and similar establishments, and Group H Occupancies	1:1-10 2:11-25 3:26-50 4:51-75 5:76-100 Over 100, add one fixture for each additional 300 persons.	1:1:1-10 2:11-25 3:26-50 4:51-75 5:76-100	one for each two water closets		one shower for each 15 persons exposed to excessive heat or to skin contamination with irritating materials

TABLE 29-A -- MINIMUM PLUMBING FIXTURES [1,2,3,4,6] (continued)

TYPE OF BUILDING OR OCCUPANCY	WATER CLOSETS[3] (fixtures per person) MALE	FEMALE	LAVATORIES[5] (fixtures per person) MALE	FEMALE	BATHTUB OR SHOWER (fixtures per person)
For the occupancies listed below, use the designated application and 200 square feet (18.58 m²) per occupant of the general use area for the minimum number of plumbing fixtures.					
Group I [7]					
Hospital waiting rooms	one per room (usable by either sex)		one per room		
Hospital general use areas	1:1-15	1:1-15	one per each two water closets		
	2:16-35	3:16-35			
	3:36-55	4:36-55			
	Over 55, add one fixture for each additional 40 persons.				
Hospital patient rooms:					
Single Bed	one adjacent to and directly accessible from		one per toilet room		one per toilet room
Isolation	one adjacent to and directly accessible from		one per toilet room		one per toilet room
Multi-Bed	one per four patients		one per four patients		one per eight patients
Long-term	one per four patients		one per four patients		one per 15 patients
Jails and reformatories					
Cell	one per cell		one per cell		
Exercise room	one per exercise room		one per exercise room		
Other institutions (on each occupied floor)	one per 25	one per 25	one per two water closets		one per eight
For the occupancies listed below, use 200 square feet (18.58 m²) per occupant for the minimum number of plumbing fixtures.					
Group M					
Retail or wholesale stores	1:1-50	1:1-50	one for each two water closets		
	2:51-100	2:51-100			
	3:101-400	3:101-200			
		4:201-300			
		5:301-400			
	Over 400, add one fixture for each additional 500 males and one for each 150 females.				

TABLE 29-A -- MINIMUM PLUMBING FIXTURES [1,2,3,4,6] (continued)

TYPE OF BUILDING OR OCCUPANCY	WATER CLOSETS[3] (fixtures per person) MALE	FEMALE	LAVATORIES[5] (fixtures per person) MALE	FEMALE	BATHTUB OR SHOWER (fixtures per person)
For Group R Occupancies, dwelling units and hotel guest rooms, use the chart. For congregate residences, use 200 square feet (18.58 m²) for Group R, Division 1 Occupancies and 300 square feet (27.87 m²) for Group R, Division 3 Occupancies for the minimum plumbing fixtures.					
Group R Dwelling units Hotel guest rooms	one per dwelling unit one per guest room		one per dwelling unit one per guest room		one per dwelling unit one per guest room
Congregate residences	one per 10 Over 10, add one fixture for each additional 25 males and over 8, add one for each additional 20 females.	one per 8	one per 12 over 12, add one fixture for each additional 20 males and one for each additional 15 females.	one per 12	one per eight For females, add one additional unit per each additional 30. Over 150, add one additional unit per each additional 20 females.
For the occupancies listed below, use 5,000 square feet (464.5 m²) per occupant for the minimum number of plumbing fixtures.					
Group S Warehouses	1:1-10 2:11-25 3:26-50 4:51-75 5:76-100 Over 100, add one for each 300 males and females.	1:1-10 2:11-25 3:26-50 4:51-75 5:76-100	One per 40 occupants of each sex.		one shower for each 15 persons exposed to excessive heat or to skin contamination with poisonous, infectious or irritating materials.

[1]The figures shown are based on one fixture being the minimum required for the number of persons indicated or any fraction thereof.

[2]Any category not mentioned specifically or about which there are any questions shall be classified by the building official and included in the category which it most nearly resembles, based on the expected use of the plumbing facilities.

[3]Where urinals are provided, one water closet less than the number specified may be provided for each urinal installed, except the number of water closets in such cases shall not be reduced to less than one half of the minimum specified. For men's facilities serving 26 or more persons, not less than one urinal shall be provided.

[4]Occupant loads over 30 shall have one drinking fountain for each 150 occupants.

[5]Twenty-four inches (610 mm) of wash sink or 18 inches (457 mm) of a circular basin, when provided with water outlets for such space, shall be considered equivalent to one lavatory.

[6]When the design occupant load is less than 10 persons, a facility usable by either sex may be approved by the building official.

[7]See WAC 246-318-690 for definitions, other fixtures and equipment for hospitals.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-2910, filed 12/21/94, effective 6/30/95.]

SPECIAL CONSTRUCTION

WAC 51-30-3102 Section 3102.5.4.

3102.5.4 Emission Standards for Factory-built Fireplaces. After January 1, 1997, no new or used factory-built fireplace shall be installed in Washington State unless it is certified and labeled in accordance with procedures and criteria specified in the UBC Standard 31-2.

To certify an entire fireplace model line, the internal assembly shall be tested to determine its particulate matter emission performance. Retesting and recertifying is required if the design and construction specifications of the fireplace model line internal assembly change. Testing for certification shall be performed by a Washington State Department of Ecology (DOE) approved and U. S. Environmental Protection Agency (EPA) accredited laboratory.

3102.7.14 Emission Standards for Certified Masonry and Concrete Fireplaces. After January 1, 1997, new certified masonry or concrete fireplaces installed in Washington State shall be tested and labeled in accordance with procedures and criteria specified in the UBC Standard 31-2.

To certify an entire fireplace model line, the internal assembly shall be tested to determine its particulate matter emission performance. Retesting and recertifying is required if the design and construction specifications of the fireplace model line internal assembly change. Testing for certification shall be performed by a Washington State Department of Ecology (DOE) approved and U. S. Environmental Protection Agency (EPA) accredited laboratory.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-3102, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31200 Section 31.200.

UNIFORM BUILDING CODE STANDARD 31-2
STANDARD TEST METHOD FOR PARTICULATE EMISSIONS FROM FIREPLACES

See Sections 3102.5.4 and 3102.7.14, *Uniform Building Code*

SECTION 31.200 - TITLE and SCOPE.

SECTION 31.200.1 - TITLE. This Appendix Chapter 31-2 shall be known as the "Washington State Standard Test Method for Particulate Emissions from Fireplaces" and may be cited as such; and will be referred to herein as "this Standard".

SECTION 31.200.2 - SCOPE. This Standard covers emissions performance, approval/certification procedures, test laboratory accreditation, record keeping, reporting requirements, and the test protocol for measuring particulate emissions from fireplaces.

All testing, reporting and inspection requirements of this Standard shall be conducted by a Washington State Depart-

ment of Ecology (DOE) approved testing laboratory. In order to qualify for DOE approval, the test laboratory must be a U. S. Environmental Protection Agency (EPA) accredited laboratory (40 CFR Part 60, Subpart AAA). DOE may approve a test laboratory upon submittal of the following information:

1. A copy of their U. S. EPA accreditation certificate, and

2. A description of their facilities, test equipment, and test-personnel qualifications including education and work experience.

DOE may revoke a test laboratory approval when the test laboratory is no longer accredited by the U. S. EPA or if DOE determines that the test laboratory does not adhere to the testing requirements of this Chapter.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31200, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31201 Section 31.201—Definitions. For the purpose of this Standard certain terms are defined as follows:

ANALYZER CALIBRATION ERROR is the difference between the gas concentration exhibited by the gas analyzer and the known concentration of the calibration gas when the calibration gas is introduced directly to the analyzer.

BURN RATE is the average rate at which test-fuel is consumed in a fireplace measured in kilograms of wood (dry basis) per hour (kg/hr) during a test-burn.

CALIBRATION DRIFT is the difference in the analyzer reading from the initial calibration response at a mid-range calibration value after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

CALIBRATION GAS is a known concentration of Carbon Dioxide (CO_2), Carbon Monoxide (CO), or Oxygen (O_2) in Nitrogen (N_2).

CERTIFICATION or AUDIT TEST is the completion of at least one, three-fuel-load test-burn cycle in accordance with Section 31.202.

FIREBOX is the chamber in the fireplace in which a test-fuel charge(s) is placed and combusted.

FIREPLACE is a wood burning device which is exempt from U. S. EPA 40 CFR Part 60, Subpart AAA and:

1. is not a cookstove, boiler, furnace, or pellet stove as defined in 40 CFR Part 60, Subpart AAA, and

2. is not a masonry heater as defined in Section 31.201, and

3. see Section 3102, Uniform Building Code for definitions of masonry and factory-built fireplaces as used in this Standard.

FIREPLACE DESIGN is the construction and/or fabrication specifications including all dimensions and materials required for manufacturing or building fireplaces with identical combustion function and particulate emissions factors.

FIREPLACE MODEL LINE is a series of fireplace models which all have the same internal assembly. Each model in a model line may have different facade designs and external decorative features.

FIREPLACE, CERTIFIED, is a fireplace that meets the emission performance standards when tested according to UBC Standard 31-2.

FIREPLACE, NON-CERTIFIED, (masonry or concrete) is any fireplace that is not a certified fireplace. A non-certified fireplace will be subject to applicable burn ban restrictions.

INTERNAL ASSEMBLY is the core construction and firebox design which produces the same function and emissions factor for a fireplace model line.

MASONRY HEATER is a wood burning device designed and intended for domestic space heating or domestic water heating, which meets the following criteria:

1. An appliance whose core is constructed primarily of manufacturer-built, supplied or specified masonry materials (i.e., stone, cemented aggregate, clay, tile, or other non-combustible non-metallic solid materials) which weigh at least 1,760 pounds (800 kg);

2. The firebox effluent travels horizontally and/or downward through one or more heat absorbing masonry duct(s) for a distance at least the length of the largest single internal firebox dimension before leaving the masonry heater;

Where, for the purposes of this subparagraph:

2.1 Horizontal or downward travel distance is defined as the net horizontal and/or downward internal duct length, measured from the top of the uppermost firebox door opening(s) to the exit of the masonry heater as traveled by any effluent on a single pathway through duct channel(s) within the heater (or average net internal duct length for multiple pathways of different lengths, if applicable). Net internal duct length is measured from center of the internal side or top surface of a duct, horizontally or vertically to the center of the opposite side or the bottom surface of the same duct, and summed for multiple ducts or directions on a single pathway, if applicable. For duct channel(s) traversing horizontal angles of less than ninety degrees from vertical, only the net actual horizontal distance traveled is included in the total duct length.

2.2 The largest single internal firebox dimension is defined as the longest of either the length or the width of the firebox hearth and the height of the firebox, measured from the floor of the combustion chamber (hearth) to the top of the uppermost firebox door opening(s).

3. The appliance has one or more air-controlling doors for fuel-loading which are designed to be closed during the combustion of fuel loads, and which control the entry of the combustion air (beyond simple spark arresting screen(s)) to one or more inlet(s) as prescribed by the masonry heater manufacturer. Manufacturer means a person who is engaged in the business of designing and constructing masonry heaters;

4. The appliance is assembled in conformance with the Underwriters' Laboratories-listed and/or manufacturer's specifications for its assembly and, if the core is constructed with a substantial proportion of materials not supplied by the manufacturer, and is certified by a representative of the manufacturer to be substantially in conformance with those specifications; and

5. The appliance has a label permanently affixed to the appliance stating that the appliance meets the criteria of this section and identifying its manufacturer and model.

RESPONSE TIME is the amount of time required for the measurement system to display 95 percent of a step change in gas concentration.

SAMPLING SYSTEM BIAS is the difference between the gas concentrations exhibited by the analyzer when a known concentration gas is introduced at the outlet of the sampling probe and when the sample gas is introduced directly to the analyzer.

SPAN is the upper limit of the gas concentration measurement range (25 percent for CO_2, O_2, and 5 percent for CO).

TEST FACILITY is the area in which the fireplace is installed, operated, and sampled for emissions.

TEST FUEL LOADING DENSITY is the weight of the as-fired test-fuel charge per unit area of usable firebox floor (or hearth).

TEST-BURN is an individual emission test which encompasses the time required to consume the mass of three consecutively burned test-fuel charges.

TEST-FUEL CHARGE is the collection of test fuel pieces placed in the fireplace at the start of certification test.

USABLE FIREBOX AREA is the floor (or hearth) area, within the fire chamber of a fireplace upon which a fire may be, or is intended to be built. Usable firebox area is calculated using the following definitions:

1. Length. The longest horizontal fire chamber dimension along the floor of the firebox that is parallel to a wall of the fire chamber.

2. Width. The shortest horizontal fire chamber dimension along the floor of the firebox that is parallel to a wall of the fire chamber.

3. For angled or curved firebox walls and/or sides, the effective usable firebox area shall be determined by calculating the sum of standard geometric areas or sub-areas of the firebox floor.

If a fireplace has a floor area within the fire chamber which is larger than the area upon which it is intended that fuel be placed and burned, the usable firebox area shall be calculated as the sum of standard geometric areas or sub-areas of the area intended for fuel placement and burning. For fireplace grates which elevate the fuel above the firebox floor, usable firebox area determined in this manner shall be multiplied by a factor of 1.5. The weight of test-fuel charges for fireplace-grate usable-firebox-area tests, shall not exceed the weight of test-fuel charges determined for the entire fireplace floor area.

ZERO DRIFT is the difference in the analyzer reading from the initial calibration response at the zero concentration level after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31201, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31202 Section 31.202—Testing.

31.202.1 Applicability. This method is applicable for the certification and auditing of fireplace particulate emission factors. This method describes the test facility, fireplace installation requirements, test-fuel charges, and fireplace operation as well as procedures for determining burn rates and particulate emission factors.

31.202.2 Principle. Particulate matter emissions are measured from a fireplace burning prepared test-fuel charges in a test facility maintained at a set of prescribed conditions.

31.202.3 Test Apparatus.

31.202.3.1 Fireplace Temperature Monitors. Device(s) capable of measuring flue-gas temperature to within 1.5 percent of expected absolute temperatures.

31.202.3.2 Test Facility Temperature Monitor. A thermocouple located centrally in a vertically oriented pipe shield 6 inches (150 mm) long, 2 inches (50 mm) diameter that is open at both ends, capable of measuring air temperature to within 1.5 percent of expected absolute temperatures.

31.202.3.3 Balance. Balance capable of weighing the test-fuel charge(s) to within 0.1 lb (0.05 kg).

31.202.3.4 Moisture Meter. Calibrated electrical resistance meter for measuring test-fuel moisture to within 1 percent moisture content (dry basis).

31.202.3.5 Anemometer. Device capable of detecting air velocities less than 20 ft/min (0.10 m/sec), for measuring air velocities near the fireplace being tested.

31.202.3.6 Barometer. Mercury, aneroid or other barometer capable of measuring atmospheric pressure to within 0.1 inch Hg (2.5 mm Hg).

31.202.3.7 Draft Gauge. Electromanometer or other device for the determination of flue draft (i.e., static pressure) readable to within 0.002 inches of water column (0.50 Pa).

31.202.3.8 Combustion Gas Analyzer. Combustion gas analyzers for measuring Carbon Dioxide (CO_2), Carbon Monoxide (CO), and Oxygen (O_2) in the fireplace exhaust-gas stream must meet all of the following measurement system performance specifications:

1. **Analyzer Calibration Error.** Shall be less than ± 2 percent of the span value for the zero, mid-range, and high-range calibration gases.

2. **Sampling System Bias.** Shall be less than ± 5 percent of the span value for the zero, mid-range, and high-range calibration gases.

3. **Zero Drift.** Shall be less than ± 3 percent of the span over the period of each run.

4. **Calibration Drift.** Shall be less than ± 3 percent of the span value over the period of each run.

5. **Response Time.** Shall be less than 1.5 minutes.

31.202.4 Emissions Sampling Method. Use the emission sampler system (ESS) as described in Section 31.203.12 or an equivalent method as determined by the application of the U. S. EPA Method 301 Validation Procedure (Federal Register, December 12, 1992, Volume 57, Number 250, page 11998) and upon approval of DOE.

31.202.5 Fireplace Installation and Test Facility Requirements. The fireplace being tested must be constructed, if site-built, or installed, if manufactured, in accordance with the designer's/ manufacturer's written instructions. The chimney shall have a total vertical height above the base of the fire chamber of not less than 15 feet (4 600 mm). The fireplace chimney exit to the atmosphere must be freely communicating with the fireplace combustion makeup-air source. There shall be no artificial atmospheric pressure differential imposed between the chimney exit to the atmosphere and the fireplace makeup-air inlet.

31.202.6 Fireplace Aging and Curing. A fireplace of any type shall be aged before certification testing begins. The aging procedure shall be conducted and documented by the testing laboratory.

31.202.6.1 Catalyst-Equipped Fireplaces. Operate the catalyst-equipped fireplace using fuel described in Section 31.203. Operate the fireplace with a new catalytic combustor in place and in operation for at least 50 hours. Record and report hourly catalyst exit temperatures, the hours of operation, and the weight of all fuel used.

31.202.6.2 Non-Catalyst-Equipped Fireplaces. Operate the fireplace using the fuel described in Section 31.203 for at least 10 hours. Record and report the hours of operation and weight of all fuel used.

31.202.7 Pretest Preparation. Record the test-fuel charge dimensions, moisture content, weights, and fireplace (and catalyst if equipped) descriptions.

The fireplace description shall include photographs showing all externally observable features and drawings showing all internal and external dimensions needed for fabrication and/or construction. The drawings must be verified as representing the fireplace being tested and signed by an authorized representative of the testing laboratory.

31.202.8 Test Facility Conditions. Locate the test facility temperature monitor on the horizontal plane that includes the primary air intake opening for the fireplace. Locate the temperature monitor 3 to 6 feet (1 000 to 2 000 mm) from the front of the fireplace in the 90° sector in front of the fireplace. Test facility temperatures shall be maintained between 65° and 90°F (18° and 32°C). Use an anemometer to measure the air velocity. Measure and record the room-air velocity within 2 feet (600 mm) of the test fireplace before test initiation and once immediately following the test-burn completion. Air velocity shall be less than 50 feet/ minute (250 mm/second) without the fireplace operating.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31202, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31203 Section 31.203—Test protocol.

31.203.1 Test Fuel. Fuel shall be air dried Douglas fir dimensional lumber or cordwood without naturally associated bark. Fuel pieces shall not be less than 1/2 nor more than 5/6 of the length of the average fire chamber width. Fuel shall be split or cut into pieces with no cross-sectional dimension greater than 6 inches (152 mm). Spacers, if used, shall not exceed 3/4 inches (19 mm) in thickness and 15 percent of the test-fuel charge weight. Fuel moisture shall be in the range of 16 to 20 percent (wet basis) or 19 to 25 percent (dry basis) meter reading.

31.203.2 Test-Fuel Loading Density. The wet (with moisture) minimum weight of each test-fuel charge shall be calculated by multiplying the hearth area in square feet by 7.0 pounds per square foot (square meters x 0.30 kg/m^2) (± 10 percent). Three test-fuel charges shall be prepared for each test-burn.

31.203.3 Kindling. The initial test-fuel charge of the three test-fuel charge test-burn shall be started by using a kindling-fuel charge which is up to 50 percent of the first test-fuel charge weight. Kindling-fuel pieces can be any size needed to start the fire or whatever is recommended in the manufacturer's (builder's) instructions to consumers. The kindling-fuel charge weight is not part of the initial test-fuel charge weight but is in addition to it.

31.203.4 Test-Burn Ignition. The fire can be started with or without paper. If used, the weight of the paper must be included in test-fuel charge weight. The remainder of the test-fuel charge may be added at any time after kindling ignition except that the entire first test-fuel charge must be added within 10 minutes after the start of the test (i.e., the time at which the flue-gas temperature at the 8-foot (2 440 mm) level is over 25°F (14°C) greater than the ambient temperature of the test facility).

31.203.5 Test Initiation. Emissions and flue-gas sampling are initiated immediately after the kindling has been ignited and when flue-gas temperatures in the center of the flue at an elevation of 8 feet (2 440 mm) above the base (floor) of the fire chamber reach 25°F (14°C) greater than the ambient temperature of the test facility.

31.203.6 Sampling Parameters. Sampling (from the 8-foot (2 440 mm) flue-gas temperature measurement location) must include:

1. Particulate Emissions
2. Carbon Dioxide (CO_2)[1]
3. Carbon Monoxide (CO)[1]
4. Oxygen (O_2)[1]
5. Temperature(s)

[1] These gases shall be measured on-line (real-time) and recorded at a frequency of not less than once every 5 minutes. These 5-minute readings are to be arithmetically averaged over the test-burn series or alternatively, a gas bag sample can be taken at a constant sample rate over the entire test-burn series and analyzed for the required gases within one hour of the end of the test-burn.

If a fireplace is equipped with an emissions control device which is located downstream from the 8-foot (2 440 mm) flue-gas temperature measurement location, a second

temperature, particulate, and gaseous emissions sampling location must be located downstream from the emissions control device but not less than 4 flue diameters upstream from the flue exit to the atmosphere. The two sampling locations must be sampled simultaneously during testing for each fireplace configuration being tested.

31.203.7 Test-Fuel Additions and Test Completion. The second and third test-fuel charges for a test-burn may be placed and burned in the fire chamber at any time deemed reasonable by the operator or when recommended by the manufacturer's and/or builder's instructions to consumers.

No additional kindling may be added after the start of a test-burn series and the flue-gas temperature at the 8-foot (2 440 mm) level above the base of the hearth must always be 25°F (14°C) greater than the ambient temperature of the test facility for a valid test-burn series. Each entire test-fuel charge must be added within 10 minutes from the addition of the first piece.

A test (i.e., a three test-fuel charge test-burn series) is completed and all sampling and measurements are stopped when all three test-fuel charges have been consumed (to more than 90 percent by weight) in the firebox and the 8-foot (2 440 mm) level flue-gas temperature drops below 25°F (14°C) greater than the ambient temperature of the test facility. Within 5 minutes after the test-burn is completed and all measurements and sampling has stopped, the remaining coals and/or unburned fuel, shall be extinguished with a carbon dioxide fire extinguisher. All of the remaining coals, unburned fuel, and ash shall be removed from the firebox and weighed to the nearest 0.1 pound (0.05 kg). The weight of these unburned materials and ash shall be subtracted from the total test-burn fuel weight when calculating the test-burn burn rate. A test-burn is invalid if less than 90 percent of the weight of the total test-fuel charges plus the kindling weight have been consumed in the fireplace firebox.

31.203.8 Test-Fuel Charge (Load) Adjustments. Test-fuel charges may be adjusted (i.e., repositioned) once during the burning of each test-fuel charge. The time used to make this adjustment shall be less than 15 seconds.

31.203.9 Air Supply Adjustment. Air supply controls, if the fireplace is equipped with controls, may not be adjusted during any test-burn series after the first 10 minutes of startup of each fuel load. All air supply settings must be set to the lowest level at the start of a test and shall remain at the lowest setting throughout a test-burn.

31.203.10 Auxiliary Fireplace Equipment Operation. Heat exchange blowers (standard or optional) sold with the fireplace shall be operated during all test-burns following the manufacturer's written instructions. If no manufacturer's written instructions are available, operate the heat exchange blower in the "high" position. (Automatically operated blowers shall be operated as designed.) Shaker grates, by-pass controls, afterburners, or other auxiliary equipment may be adjusted only once per test-fuel charge following the manufacturer's written instructions. Record and report all adjustments on a fireplace operational written-record.

31.203.11 Fireplace Configurations. One, 3 test-fuel charge test-burn shall be conducted for each of the following fireplace operating configurations:

1. Door(s) closed, with hearth grate;
2. Door(s) open, with hearth grate;
3. Door(s) closed, without hearth grate;
4. Door(s) open, without hearth grate; and
5. With no doors, and draft inducer on.

No test-burn series is necessary for any configuration the appliance design cannot or is not intended to accommodate. If a configuration is not tested, the reason must be submitted with the test report and the appliance label must state that the appliance cannot be used in that configuration by consumer users.

One emission factor result, or one emission factor average, as provided in paragraph 31.203.11.2, from each fireplace configuration tested shall be compiled into an arithmetic average of all the configurations tested for determining compliance with the requirements of paragraph 31.204.2.

31.203.11.1 Closed-Door(s) Testing. For all closed-door test configurations, the door(s) must be closed within 10 minutes from the addition of the first test-fuel piece of each test-fuel charge in a test-burn. During a test-burn, the door(s) cannot be re-opened except during test-fuel reload and adjustment as referenced in Sections 31.203.7 and 31.203.8.

31.203.11.2 Additional Test-Burn. The testing laboratory may conduct more than one test-burn series for each of the applicable configurations specified in Section 31.203.11. If more than one test-burn is conducted for a specified configuration, the results from at least 2/3 of the test-burns for that configuration shall be used in calculating the arithmetic average emission factor for that configuration. The measurement data and results of all tests conducted shall be reported regardless of which values are used in calculating the average emission factor for that configuration.

31.203.12 Emissions Sampling System (ESS).

31.203.12.1 Principle. Figure 31-2-1 shows a schematic of an ESS for sampling solid-fuel-fired fireplace emissions. Except as specified in Section 31.202.4, an ESS in this configuration shall be used to sample all fireplace emissions. The ESS shall draw flue gases through a 15 inch (380 mm) long, 3/8 inch (10 mm) O.D. stainless steel probe which samples from the center of the flue at an elevation which is 8 feet (2 440 mm) above the floor of the firebox (i.e., the hearth). A flue-gas sample shall then travel through a 3/8 inch (10 mm) O.D. Teflon® tube, and a heated U. S. EPA Method 5-type glass-fiber filter (40 CFR Part 60, Appendix A) for collection of particulate matter. The filter shall be followed by an in-line flow-through cartridge containing 20 grams of XAD-2 sorbent resin for collecting semi-volatile hydrocarbons. Water vapor shall then be removed from the sampled gas by a silica-gel trap. Flue-gas oxygen concentrations, which shall be used to determine the ratio of flue-gas volume to the amount of fuel burned, are measured within the ESS system by an electrochemical cell meeting the

performance specifications presented in Section 31.202.3.8 (1.).

The ESS shall use a critical orifice to maintain a nominal flue-gas sampling rate of 0.035 cfm (0.0167 liters per second). The actual flow rate through each critical orifice shall be determined to within 0.000354 cubic feet (0.01 liters) per second before and after each test-burn with a bubble flow meter to document exact sampling rates. The post-test-burn critical-orifice flow-rate determinations shall be performed before the ESS is dismantled for sample recovery and clean-up. Pre-test-burn and post-test-burn critical-orifice flow-rate measurements shall be within 0.0000117 cubic feet (0.00033 liters) per second of each other or the test-burn emissions results shall be invalid. Temperatures shall be monitored using type K ground-isolated, stainless-steel-sheathed thermocouples.

The ESS unit shall return particle-free and dry exhaust gas to the flue via a 1/4 inch (6 mm) Teflon® line and a 15 inch (380 mm) stainless steel probe inserted into the flue. A subsample aliquot of the flue-gas sample-gas stream exiting the ESS unit, shall be pumped into a 1 cubic foot (29 liter) Tedlar® bag for measuring the average carbon dioxide, carbon monoxide, and confirmation of average oxygen concentrations for the test period. Flow to the subsample gas bag shall be controlled by a solenoid valve connected to the main pump circuit and a fine-adjust needle-controlled flow valve. The solenoid valve shall be open only when the pump is activated, allowing the subsample gas to be pumped into the gas bag at all times when the ESS pump is on. The rate of flow into the bag shall be controlled by the fine-adjust metering needle-valve which is adjusted at setup so that 4.7 to 5.2 gal (18 to 20 liters) of gas is collected over the entire 3 test-fuel charge test-burn without over-pressurizing the gas sample bag.

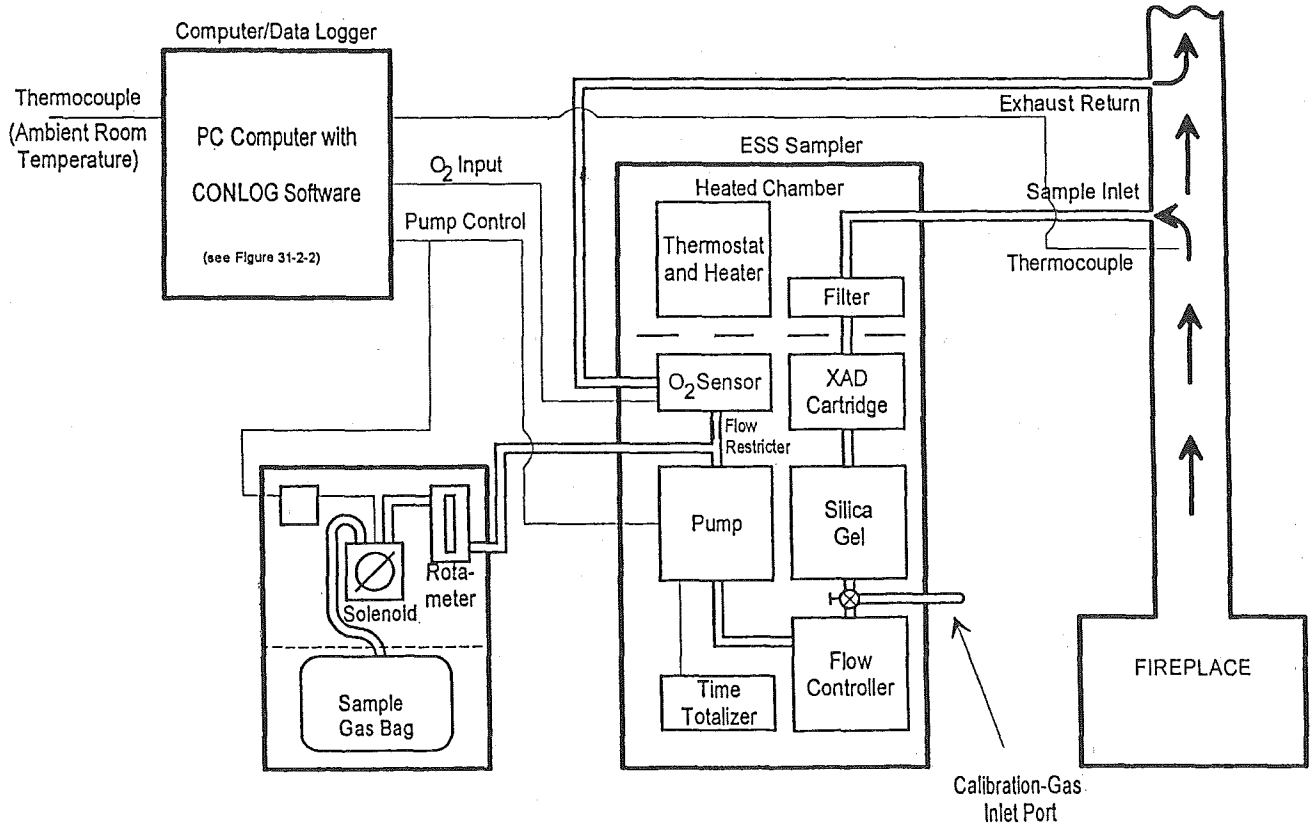


Figure 31-2-1. Schematic of ESS/Data Logger system.

31.203.12.2 The Data Acquisition and Control System. The data acquisition and control system for the ESS is shown in Figure 31-2-2. This system consists of a personal computer (PC) containing an analog-to-digital data processing board (12-bit precision), a terminal (connection) box, and specialized data acquisition and system control software (called CONLOG).

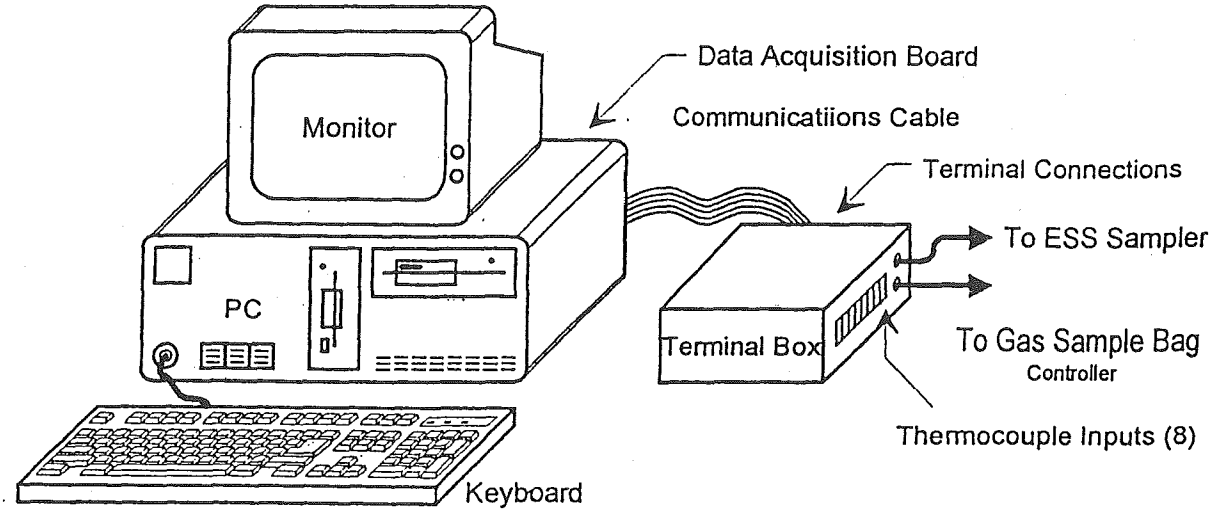


Figure 31-2-2. ESS data logger system.

For fireplace testing, the CONLOG software is configured to control, collect, and store the following data:

1. Test-period starting and ending times and dates, and total length of sampling period,

2. Pump-cycle on/off, cycle length and thermocouple (TC) cycle recording interval (frequency),

3. Temperature records, including flue-gas and ambient temperatures, averaged over pre-selected intervals,

4. Date, times, and weights of each added fuel load, and

5. Flue-gas oxygen measurements taken during each sample cycle.

During testing, instantaneous readings of real-time data shall be displayed on the system status screen. These data shall include the date, time, temperatures for each of the TCs, and flue-gas oxygen concentrations. The most recent 15 sets of recorded data shall also be displayed.

Flue-gas sampling and the recording of flue-gas oxygen concentrations shall only occur when flue-gas temperatures are above 25°F (14°C) greater than the ambient temperature of the test facility. Temperatures and fueling shall always be recorded at five-minute intervals regardless of flue-gas temperature. The ESS sampling-pump operating cycle shall be adjustable as described in Section 31.203.12.3.

31.203.12.3 ESS Sampling-Pump Operating Cycle. The ESS sampling-pump operating cycle shall be adjusted to accommodate variable test-fuel charge sizes, emission factors, and the length of time needed to complete a test-burn series. The sampler-pump operation shall be adjustable from 1 second to 5 minutes (100 percent) "on" for every 5-minute test-burn data-recording interval. This will allow adjustment for the amount of anticipated emissions materials that will be sampled and deposited on the ESS filter, XAD-2, and the other system components. It is recommended that the minimum sample quantities stipulated in Section 31.203.12.4 be used to calculate the appropriate pump cycle "on" and "off" periods. It should be noted that if the sampler collects too much particulate material on the filter and in the XAD-2 cartridge, the unit may fail the sample flow calibration check required at the end of each test-burn.

31.203.12.4 Minimum Sample Quantities. For each complete 3 test-fuel charge test-burn, the ESS must catch a minimum total particulate material mass of at least 0.231 grains (15 mg). Alternatively, the ESS must sample a minimum of 10 cubic feet (283 liters) during each 3 test-fuel charge test-burn. If this volume cannot be sampled in the test-burn time period, two ESS samplers must be utilized to sample fireplace emissions simultaneously during each test-burn. If emissions results from the two ESSs are different by more than 10 percent of the lower emissions-factor result, the test-burn results are invalid. An arithmetic average is calculated for test-burn results when two ESSs are utilized.

31.203.12.5 Equipment Preparation and Sample Processing Procedures.

31.203.12.5.1. Prior to emissions testing, the ESS unit shall be prepared with a new, tared glass-fiber filter and a clean XAD-2 sorbent-resin cartridge. Within 3 hours after testing is completed, the stainless steel sampling probe, Teflon® sampling line, filter holder, and XAD-2 cartridge(s) shall be removed from the test site and transported to the laboratory for processing. Each component of the ESS sampler shall be processed as follows:

1. Filter: The glass fiber filter (4 inches (102 mm) in diameter) shall be removed from the ESS filter housing and placed in a petri dish for desiccation and gravimetric analysis.

2. XAD-2 sorbent-resin cartridge: The sorbent-resin cartridge shall be extracted in a Soxhlet extractor with dichloromethane for 24 hours. The extraction solution shall

be transferred to a tared glass beaker and evaporated in an ambient-air dryer. The beaker with dried residue shall then be desiccated to constant weight (less than ± 0.5 mg change within a 2-hour period), and the extractable residue shall be weighed.

3. ESS hardware: All hardware components which are in the flue-gas sample stream (stainless steel probe, Teflon® sampling line, stainless steel filter housing, and all other Teflon® and stainless steel fittings) through the top of the sorbent-resin cartridge, shall be cleaned with a solvent mixture of 50 percent dichloromethane and 50 percent methanol. The cleaning solvent solutions shall be placed in tared glass beakers, evaporated in an ambient-air dryer, desiccated to constant weight (less than ± 0.5 mg change within a 2-hour period), and weighed.

EPA Method 5H procedures (40 CFR Part 60, Appendix A) for desiccation and weighing time intervals shall be followed for steps 1 through 3 above.

31.203.12.5.2 The ESS shall be serviced both at the start and end of a fireplace testing period. During installation, leak checks shall be performed; the thermocouples, fuel-weighing scale, and oxygen-cell shall be calibrated, and the data logger shall be programmed. At the end of the test period, final calibration, and leak-check procedures shall again be performed, and the ESS sampling line, filter housing, XAD-2 cartridge, sampling probe, and Tedlar® bag shall be removed, sealed, and transported to the laboratory for analysis. If the pre-test and post-test leak checks of the ESS system exceed 0.00033 liters per second, the test-burn emission results shall be invalid.

31.203.12.6 Data Processing and Quality Assurance.

31.203.12.6.1 Upon returning to the laboratory facilities, the data file (computer disk) shall be reviewed to check for proper equipment operation. The data-logger data files, log books, and records maintained by field staff shall be reviewed to ensure sample integrity.

The computer-logged data file shall be used in conjunction with the ESS particulate samples and sample-gas bag analyses to calculate the emission factor, emission rate, and fireplace operational parameters. An example ESS results report is presented in Table 31-2-A.

31.203.12.6.2 Burning Period. The total burning period is calculated by:

Total Burning Period = (Length of each sample cycle) x (Number of flue temperature readings over 25°F (14°C) greater than the ambient temperature of the test facility).

WHERE:

1. Length of each sample cycle: The time between each temperature recording as configured in the CONLOG software settings (standardized at 5 minutes).

2. Number of flue temperature readings during fireplace use: The total number of temperature readings when the calibrated temperature value was more than 25°F (14°C) greater than the ambient temperature of the test facility.

31.203.12.6.3 Particulate Emissions.

31.203.12.6.3.1 ESS Particulate Emission Factor. The equation for the total ESS particulate emission factor for each test-burn presented below produces reporting units of grams per dry kilogram of fuel burned (g/kg):

$$\text{Particulate emission factor (g/kg)} = \frac{\text{(Particulate Catch) x (Stoichiometric Volume) x (Flue-gas Dilution Factor)}}{\text{(Sampling Time) x (Sampling Rate)}}$$

WHERE:

1. Particulate Catch: The total mass, in grams, of particulate material caught on the filter, in the XAD-2 resin cartridge (semi-volatile compounds); and in the probe clean-up and rinse solutions.

2. Stoichiometric Volume: Stoichiometric volume is the volume of dry air needed to completely combust one dry kilogram of fuel with no "excess air". This value is determined by using a chemical reaction balance between the specific fuel being used and the chemical components of air. The stoichiometric volume for Douglas fir is 86.78 cubic feet per pound (5 404 liters per dry kilogram) at 68°F (20°C) and 29.92 inches (760 mm) of mercury pressure.

3. Flue-gas Dilution Factor: The degree to which the sampled combustion gases have been diluted in the flue by air in excess of the stoichiometric volume (called excess air). The dilution factor is obtained by using the average sampled carbon dioxide and carbon monoxide values obtained from the sample gas bag analyses and the following equation.

$$\text{Flue-Gas Dilution Factor} = \frac{18.53 + \left(\left(1 - \left(\frac{(CO_2 + 1/2\ CO)}{18.53}\right)\right) \times 2.37\right)}{(CO_2 + 1/2\ CO)}$$

Note: Multiplying the g/kg emission factor by the burn rate (dry kg/hr) yields particulate emissions in grams per hour (g/hr). Burn rate is calculated by the following equation:

$$\text{Burn Rate (kg/hr)} = \frac{\text{Total Fuel (kg)}}{\text{Total Burn Period (hours)}}$$

WHERE:

Total Fuel is the total fuel added during the entire test-burn minus the remaining unburned materials at the end of the test-burn.

4. Sampling Time: The number of minutes the sampler pump operated during the total test-burn period.

5. Sampling Rate: Sampling rate is controlled by the critical orifice installed in the sampler. The actual calibrated sampling rate is used here.

31.203.12.6.3.2 EPA Method 5H Particulate Emissions. ESS-measured emissions factors submitted to DOE for approval must first be converted to U. S. EPA Method 5H equivalents. The ESS particulate emissions factor results obtained in Section 31.203.12.6.1 are converted to be equivalent to the U. S. EPA Method 5H emissions factor results by the following equation:

$$1.254 + (0.302 \times PEF) + (1.261 \times 10^{PEF})$$

WHERE:

PEF is the ESS-measured particulate emission factor for a test-burn.

31.203.12.6.4 CO Emissions. The carbon monoxide (CO) emission factor equation produces grams of CO per dry kilogram of fuel burned. The grams per kilogram equation includes some equation components described above.

$$\text{CO emission factor (g/kg)} = \frac{\text{(Fraction CO) x (Stoich. Volume) x (Dilution Factor) x (Molecular Weight of CO)}}{\text{(24.45 L/mole)}}$$

WHERE:

1. Fraction CO: The fraction of CO measured in the gas sampling bag.

Note: Percent CO divided by 100 gives the fraction CO.

2. Molecular Weight of CO: The gram molecular weight of CO, 28 pounds per pound-mole (28.0 g/g-mole).

Multiplying the results of the above equation by the burn rate (dry kg/hr) yields the grams per hour (g/hr) CO emission rate.

Table 31-2-A Example ESS Data Results Format

ESS Emission Results

Test Facility Location:	xxxx
Test Laboratory:	xxxx
Test-Burn Number:	xxxx
Start Time/Date:	xxxx
End Time/Date:	xxxx
Fireplace Model:	xxxx

TIME

Total Test Period	152.3 hours
Total Burn Time	64.6 hours
Flue >25 Degrees F above ambient temperature	42.4 %

CARBON MONOXIDE EMISSIONS

Gram / Kilogram	48.0 g/kg
Gram / Hour	64.0 g/hr
Gram / Cubic Meter	1.25 g/m^3

ESS SETTINGS

ESS Sample Rate	1.004 l/min
Sample Cycle	5.0 min
Sample Time / Sample Cycle	0.443 min

AVERAGE TEMPERATURES

Fuel-Gas Temperatures	275 °F 135 °C
Flue Exit Temperature	308 °F 154 °C
Test Facility Ambient Temperature	66 °F 19 °C

TEST FUEL

Total Fuel Used (wet weight)	101.3 kg
Ave. Fuel Moisture (dry basis)	17.7 %
Total Fuel Used (dry weight)	86.1 kg
Average Test-Fuel Charge	14.5 kg
Average Burn Rate kg/hr	1.33 dry

AVERAGE FLUE-GAS CONCENTRATIONS

Flue Oxygen (SE)	18.15 %
Flue Oxygen (gas bag or analyzer)	18.05 %
Flue CO (gas bag or analyzer)	0.10 %
Flue CO_2 (gas bag or analyzer)	2.60 %

PARTICULATE EMISSIONS (EPA Method 5H Equivalents)

Gram / Kilogram	2.6 g/kg
Gram / Hour	3.4 g/hr
Gram / Cubic Meter	0.06 g/m^3

BREAKDOWN OF ESS PARTICULATE SAMPLE

Rinse	25.5 mg
XAD	6.3 mg
Filter	15.7 mg
Blank	0.0 mg
TOTAL	**47.4 mg**

Notes:
NM = Not Measured, NA = Not Applicable, NU = Not Used
Total time flue temperature greater than 25°F over ambient temperature.

TEST PERFORMED BY: XYZ Testing International, Olympia Washington, 98504

31.203.13 Calibrations.

31.203.13.1 Balance. Before each certification test, the balance used for weighing test-fuel charges shall be audited by weighing at least one calibration weight (Class F) that corresponds to 20 percent to 80 percent of the expected test-

fuel charge weight. If the scale cannot reproduce the value of the calibration weight within 0.1 lb (0.05 kg) or 1 percent of the expected test-fuel charge weight, whichever is greater, re-calibrate the scale before use with at least five calibration weights spanning the operational range of the scale.

31.203.13.2 Temperature Monitor. Calibrate the temperature monitor before the first certification test and semiannually thereafter.

31.203.13.3 Fuel Moisture Meter. Calibrate the fuel moisture meter as per the manufacturer's instructions before each certification test.

31.203.13.4 Anemometer. Calibrate the anemometer as specified by the manufacturer's instructions before the first certification test and semiannually thereafter.

31.203.13.5 Barometer. Calibrate the barometer against a mercury barometer before the first certification test and semiannually thereafter.

31.203.13.6 Draft Gauge. Calibrate the draft gauge as per the manufacturer's instructions; a liquid manometer does not require calibration.

31.203.13.7 ESS. The ESS shall be calibrated as specified in Section 31.203.12.1.

31.203.14 Reporting Criteria. Submit both raw and reduced data for all fireplace tests. Specific reporting requirements are as follows:

31.203.14.1 Fireplace Identification. Report fireplace identification information including manufacturer, model, and serial number. Include a copy of fireplace installation and operation manuals.

31.203.14.2 Test Facility Information. Report test facility location, temperature, and air velocity information.

31.203.14.3 Test Equipment Calibration and Audit Information. Report calibration and audit results for the test-fuel balance, test-fuel moisture meter, analytical balance, and sampling equipment including volume metering systems and gaseous analyzers.

31.203.14.4 Pretest Information and Conditions. Report all pretest conditions including test-fuel charge weight, fireplace temperatures, and air supply settings.

31.203.14.5 Particulate Emission Data. Report a summary of test results for all test-burns conducted and the arithmetically averaged emission factor for all test-burns used for certification. Submit copies of all data sheets and other records collected during the testing. Submit examples of all calculations.

31.203.14.6 Required Test Report Information and Suggested Format. Test report information requirements to be provided to DOE for approval/certification of fireplaces are presented in this Standard. The requirements are presented here in a recommended report format.

31.203.14.6.1 Introduction.

1. Purpose of test: Certification or audit.

2. Fireplace identification: Manufacturer, model number, catalytic/non-catalytic, and options. Include a copy of fireplace installation and operation manuals.

3. Laboratory: Name, location, and participants.

4. Test information: Date fireplace was received, date of tests, sampling methods used, and number of test-burns.

31.203.14.6.2 Summary and Discussion of Results.

1. Table of results: Test-burn number, burn rate, particulate emission factor (in U. S. EPA Method 5H equivalents), efficiency (if determined), and averages (indicate which test-burns are used).

2. Summary of other data: Test facility conditions, surface temperature averages, catalyst temperature averages, test-fuel charge weights, and test-burn times.

3. Discussion: Specific test-burn problems and solutions.

31.203.14.6.3 Process Description.

1. Fireplace dimensions: Volume, height, width, lengths (or other linear dimensions), weight, and hearth area.

2. Firebox configuration: Air supply locations and operation, air supply introduction location, refractory location and dimensions, catalyst location, baffle and by-pass location and operation (include line drawings and photographs).

3. Process operation during test: Air supply settings and adjustments, fuel bed adjustments, and draft.

4. Test fuel: Test fuel properties (moisture and temperature), test fuel description (include line drawing or photograph), and test fuel charge density.

31.203.14.6.4 Sampling Locations. Describe sampling location relative to fireplace. Include linedrawings and photographs.

31.203.14.6.5 Sampling and Analytical Procedures.

1. Sampling methods: Brief reference to operational and sampling procedures, and optional and alternative procedures used.

2. Analytical methods: Brief description of sample recovery and analysis procedures.

31.203.14.6.6 Quality Control and Assurance Procedures and Results.

1. Calibration procedures and results: Certification, sampling, and analysis procedures.

2. Test method quality control procedures: Leak-checks, volume-meter checks, stratification (velocity) checks, and proportionality results.

31.203.14.6.7 Appendices.

1. **Results and Example Calculations.** Include complete summary tables and accompanying examples of all calculations.

2. **Raw Data.** Include copies of all uncorrected data sheets for sampling measurements, temperature records, and sample recovery data. Include copies of all burn rate and fireplace temperature data.

3. **Sampling and Analytical Procedures.** Include detailed description of procedures followed by laboratory personnel in conducting the certification test, emphasizing particularly, parts of the procedures differing from the prescribed methods (e.g., DOE approved alternatives).

4. **Calibration Results.** Summary of all calibrations, checks, and audits pertinent to certification test results including dates.

5. **Participants.** Test personnel, manufacturer representatives, and regulatory observers.

6. **Sampling and Operation Records.** Copies of uncorrected records of activities not included on raw data sheets (e.g., fireplace door open times and durations).

7. **Additional Information.** Fireplace manufacturer's written instructions for operation during the certification test and copies of the production-ready (print-ready) temporary and permanent labels required in Section 31.208 shall be included in the test report prepared by the test laboratory.

31.203.14.7 References.

1. Code of Federal Regulations, U. S. EPA Title 40, Part 60, Subpart AAA and Appendix A (40 CFR Part 60).

2. Barnett, S. G. and P. G. Fields, 1991, "In-Home Performance of Exempt Pellet Stoves in Medford, Oregon," prepared for U. S. Department of Energy, Oregon Department of Energy, Tennessee Valley Authority, and Oregon Department of Environmental Quality, July 1991.

3. Barnett, S. G. and R. R. Roholt, 1990, "In-Home Performance of Certified Pellet Stoves in Medford and Klamath Falls, Oregon," prepared for the U. S. Department of Energy, 1990.

4. Barnett, S. G., 1990, "Field Performance of Advanced Technology Woodstoves in Glens Falls, New York, 1988-1989," for New York State Energy Research and Development Authority, U. S. EPA, Coalition of Northeastern Governors, Canadian Combustion Research Laboratory, and the Wood Heating Alliance, December 1989.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31203, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31204 Section 31.204—Approval procedure for fireplaces. On or after the effective date of this regulation, a manufacturer or builder of a fireplace who wishes to have a fireplace model line or fireplace design designated as an approved (or certified) fireplace, shall submit to DOE for its review the following information:

31.204.1 Manufacturer name and street address, model or design identification, construction specifications, and drawings of the firebox and required chimney system.

31.204.2 A test report prepared in accordance with Section 31.203.14.6 showing that testing has been conducted by a DOE approved and U. S. EPA accredited laboratory, and that the arithmetically averaged particulate emission factors for that fireplace model line or design, tested in accordance with UBC Standard Section 31.202, does not exceed 7.3 g/kg (U. S. EPA Method 5H equivalent as determined in Section 31.203.12.6.3.2) for a factory-built fireplace model lines or designs or 12.0 g/kg (U. S. EPA Method 5H equivalent as determined in Section 31.203.12.6.3.2) for new certified masonry fireplace model lines or designs. After January 1, 1999, particulate emission factors for factory-built and new certified masonry fireplace model lines or designs shall not exceed 7.3 g/kg (U. S. EPA Method 5H equivalents as determined in Section 31.203.12.6.3.2).

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31204, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31205 Section 31.205—Approval of non-tested fireplaces. On or after the effective date of this regulation, DOE may grant approval for a fireplace model line or design that has not been tested pursuant to Section 31.204 upon submission of the following by the applicant:

31.205.1 Manufacturer name and street address, model or design identification, construction specifications, and drawings of the internal assembly system.

31.205.2 Documentation from an EPA accredited laboratory that the model is a fireplace within the definition of this regulation, has substantially the same core construction as a model already tested by a DOE approved and EPA accredited laboratory, and is substantially similar to the approved model in internal assembly design, combustion function, and probable emissions performance as listed in Section 31.204.2.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31205, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31206 Section 31.206—Approval through alternative test protocol. As provided in Section 31.202.4, an alternative testing protocol may be submitted by a DOE approved and EPA accredited laboratory for acceptance by DOE as equivalent to Uniform Building Code Standard 31-2.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31206, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31207 Section 31.207—Approval termination. All fireplace model line or design approvals shall terminate five years from the approval date. Previously approved fireplace model line and/or design may be granted re-approval (re-certification) upon application to and review by DOE. No testing shall be required for fireplace model line or design re-approvals unless DOE determines that design changes have been incorporated into the fireplace that could adversely affect the emissions factor, or testing is otherwise stipulated by DOE.

DOE may revoke a fireplace model line or design approval certification if it is determined that the fireplaces being produced in a specific model line do not comply with the requirements of Section 31.200. Such a determination shall be based on all available evidence, including:

1. Test data from a retesting (audit test) of the original unit on which the certification test was conducted or a sample unit from the current model line,

2. A finding that the certification test was not valid,

3. A finding that the labeling of the fireplace does not comply with the requirements of Section 31.200,

4. Failure by the fireplace manufacturer (builder) to comply with reporting and record keeping requirements under Section 31.200,

5. Physical examination showing that a significant percentage of production units inspected are not similar in all material respects to the fireplace submitted for testing, or

6. Failure of the manufacturer to conduct a quality assurance program in conformity with Section 31.208.

Revocation of certification under this section shall not take effect until the manufacturer (builder) concerned has been given written notice by DOE setting forth the basis for the proposed determination and an opportunity to request a hearing.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31207, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31208 Section 31.208—Quality control. Once within 30 days of each annual anniversary after the initial approval/certification, a DOE approved and U. S. EPA accredited laboratory shall inspect the most recently produced fireplace of an approved model line or design at its manufacturing location (site, if site-built) to document adherence to the approved/certified fireplace design specifications. If no fireplaces of an approved model line or design were produced (built) during the previous 12 months, no inspection is required.

An inspection report for each approved fireplace model line or design must be submitted to DOE within 30 days after the inspection date. The inspection report shall include, as a minimum, the model identification and serial number of the fireplace inspected, the location where the model was inspected, the names of the manufacturer's and/or builder's representatives present, the date of inspection, and a description of any changes made to the approved fireplace model line or design since the last inspection. The U. S. EPA accredited laboratory which conducts the annual quality control inspection is responsible for auditing the content and format of all labels to be applied to approved fireplaces as stipulated in Section 31.209.

A fireplace model line or design shall be re-tested in accordance with Section 31.202 if it is determined during inspection that design changes have been incorporated into the approved/certified fireplace design which adversely affect the fireplace particulate emissions factor. Design elements which can affect fireplace particulate emissions include:

1. Grate placement and height,

2. Air supply minimum and maximum controls,

3. Usable hearth area, and

4. Firebox height, width, and length dimensions.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31208, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31209 Section 31.209—Permanent label, temporary label and owner's manual.

31.209.1 Labels and the Owner's Manual. Labels and owner's manual shall be prepared and installed in all certified "For Sale" fireplaces as specified in U. S. EPA 40 CFR Part 60, Section 60.536. Information that shall be presented on all labels includes:

1. Manufacturer's or builder's name, address, and phone number,

2. Model number and/or name,

3. Month and year of manufacture,

4. Starting and ending dates for the 5-year approval period,

5. If a fireplace was tested and approved with an emissions control device which is not an integral part of the fireplace structure, the label shall state that "The fireplace can not be sold or installed without the specified emissions control device in place and operational.",

6. On certified fireplaces the statement: "This appliance has been tested and has demonstrated compliance with Washington State amendment to the UBC Standard, Chapter 31-2 requirements."

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31209, filed 12/20/95, effective 1/1/97.]

WAC 51-30-31210 Section 31.210—List of approved fireplaces. DOE shall maintain a list of approved fireplace model lines and designs, and that list shall be available to the public.

[Statutory Authority: RCW 19.27.074(1) and 70.94.457 (1)(b), (c). 96-01-120, § 51-30-31210, filed 12/20/95, effective 1/1/97.]

WAC 51-30-3400 Chapter 34—Existing structures.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-3400, filed 12/21/94, effective 6/30/95.]

WAC 51-30-3404 Section 3404—Moved buildings.

Buildings or structures moved into or within a jurisdiction shall comply with the provisions of this code, the Uniform Mechanical Code (WAC 51-32), the Uniform Fire Code and Standards (WAC 51-34 and 51-35), the Uniform Plumbing Code and Standards (WAC 51-26 and 51-27), the Washington State Energy Code (WAC 51-11) and the Washington State Ventilation and Indoor Air Quality Code (WAC 51-13) for new buildings or structures.

EXCEPTION: Group R, Division 3 buildings or structures are not required to comply if:
1. The original occupancy classification is not changed, and
2. The original building is not substantially remodeled or rehabilitated. For the purposes of this section a building shall be considered to be substantially remodeled when the costs of remodeling exceed 60 percent of the value of the building exclusive of the costs relating to preparation, construction, demolition or renovation of foundations.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-3404, filed 12/21/94, effective 6/30/95.]

THIS APPENDIX IS FOR REFERENCE ONLY. IT IS NOT THE RESPONSIBILITY OF THE BUILDING OFFICIAL TO ENFORCE IT.
APPENDIX CHAPTER 11
DIVISION I
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL FAIR HOUSING ACT
GUIDELINES FOR SITE TERRAIN EXEMPTIONS

WAC 51-30-93115 Section 93115.

Section 93115.1 Purpose. The purpose of this division is to provide the United States Department of Housing and Urban Development Federal Fair Housing Act Guidelines for Site Terrain Exemptions.

93115.2 Scope.

93115.2.1 General. The provisions of this division may apply to all buildings and dwelling units that are regulated by the Federal Fair Housing Act Amendments of 1988.

93115.2.2 Applicability of Other Provisions. Except as specifically allowed by this division for determining site terrain exemptions, Group R, Division 1 apartment houses shall meet all applicable provisions of this code.

93115.3 Definitions. For the purpose of this division, certain terms are defined as follows:

COVERED MULTIFAMILY DWELLINGS means buildings consisting of four or more dwelling units if such buildings have one or more elevators; and ground floor dwelling units in other buildings consisting of four or more dwelling units. Dwelling units within a single structure separated by firewalls do not constitute separate buildings.

FINISHED GRADE means the ground surface of the site after all construction, leveling, grading, and development has been completed.

UNDISTURBED SITE means the site before any construction, leveling, grading, or development associated with the current project.

93115.4 Site Impracticality.

93115.4.1 General. Covered multifamily dwellings with elevators shall be designed and constructed to provide at least one accessible entrance on an accessible route, regardless of terrain or unusual characteristics of the site. Covered multifamily dwellings without elevators shall be designed and constructed to provide at least one accessible entrance on an accessible route unless terrain or unusual characteristics of the site are such that the following conditions are found to exist:

A. **Site Impracticality Due to Terrain.** There are two alternative tests for determining a site impracticality due to terrain: The individual building test provided in paragraph (1), or the site analysis test provided in paragraph (2). These tests may be used as follows.

A site with a single building having a common entrance for all units may be analyzed only as described in paragraph (1).

All other sites, including a site with a single building having multiple entrances serving either individual dwellings units or clusters of dwelling units, may be analyzed using the methodology in either paragraph (1) or paragraph (2). For these sites for which either test is applicable, regardless of which test is selected, at least 20% of the total ground floor units in nonelevator buildings, on any site, must comply with the guidelines.

1. **Individual Building Test.** It is impractical to provide an accessible entrance served by an accessible route when the terrain of the site is such that:

1.1. The slopes of the undisturbed site measured between the planned entrance and all vehicular or pedestrian arrival points within 50 feet (15 m) of the planned entrance exceed 10 percent.

1.2. The slopes of the planned finished grade measured between the entrance and all vehicular or pedestrian arrival points within 50 feet (15 m) of the planned entrance also exceed 10 percent.

If there are no vehicular or pedestrian arrival points within 50 feet (15 m)of the planned entrance, the slope for the purpose of this paragraph (1) will be measured to the closest vehicular or pedestrian arrival point.

For purposes of these guidelines, vehicular or pedestrian arrival points include public or resident parking areas; public transportation stops; passenger loading zones; and public streets or sidewalks. To determine site impracticality, (1) the slope would be measured at ground level from the point of the planned entrance, or (2) if there are no vehicular or pedestrian arrival points close to the planned entrance. In the case of sidewalks, the closest point to the entrance will be where a public sidewalk entering the site intersects with the sidewalk to the entrance. In the case of resident parking areas, the closest point to the planned entrance will be measured from the entry point to the parking area that is located closest to the planned entrance.

2. **Site Analysis Test.** Alternatively, for a site having multiple buildings, or a site with a single building with multiple entrances, impracticality of providing an accessible entrance served by an accessible route can be established by the following steps:

2.1. The percentage of the total buildable area of the undisturbed site with a natural grade less than 10% slope shall be calculated. The analysis of the existing slope (before grading) shall be done on a topographic survey with two foot (610 mm) contour intervals with slope determination made between each successive interval. The accuracy of the slope analysis shall be certified by a professional licensed engineer, landscape architect, architect, or surveyor.

2.2. To determine the practicality of providing accessibility to planned multifamily dwellings based on the topography of the existing natural terrain, the minimum percentage of ground floor units to be made accessible should equal the percentage of the total buildable area (not including floodplain, wetlands, or other restricted use areas) of the undisturbed site that has an existing natural grade of less than 10% slope.

2.3. In addition to the percentage established in paragraph 2.2, all ground floor units in a building, or ground floor units served by a particular entrance, shall be made accessible if the entrance to the units is on an accessible route, defined as a walkway with a slope between the planned entrance and a pedestrian or vehicular arrival point that is no greater than 8.33%.

B. **Site Impracticality Due to Unusual Characteristics.** Unusual characteristics include sites located in a federally-designated floodplain or coastal high-hazard area and sites subject to other similar requirements of law or code that the lowest structural member of the lowest floor must be raised to a specified level at or above the base flood elevation. An accessible route to a building entrance is impractical due to unusual characteristics of the site when:

1. The unusual site characteristics result in a difference in finished grade elevation exceeding 30 inches (760 mm) and 10 percent measured between an entrance and all vehicular or pedestrian arrival points within 50 feet (15 m) of the planned entrance; or

2. If there are no vehicular or pedestrian arrival points within 50 feet (15 m) of the planned entrance, the unusual characteristics result in a difference in finished grade elevation exceeding 30 inches (760 mm) and 10 percent measured between an entrance and the closest vehicular or pedestrian arrival point.

93115.4.2 Exceptions to Site Impracticality. Regardless of site considerations described in Section 93115.4.1, an accessible entrance on an accessible route is practical when:

A. There is an elevator connecting the parking area with the dwelling units on a ground floor. (In this case, those dwelling units on the ground floor served by an elevator, and at least one of each type of public and common use areas, would be subject to these guidelines.) However:

1. Where a building elevator is provided only as a means of creating an accessible route to dwelling units on a ground floor, the building is not considered an elevator building for purposes of theses guidelines; hence, only the ground floor dwelling units would be covered.

2. If the building elevator is provided as a means of access to dwelling units other than dwelling units on a ground floor, then the building is an elevator building which is a covered multifamily dwelling, and the elevator in that building must provide accessibility to all dwelling units in the building, regardless of the slope of the natural terrain; or

B. An elevated walkway is planned between a building entrance and a vehicular or pedestrian arrival point and the planned walkway has a slope no greater than 10 percent.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-93115, filed 12/21/94, effective 6/30/95.]

THIS APPENDIX IS FOR REFERENCE ONLY. IT IS NOT THE RESPONSIBILITY OF THE BUILDING OFFICIAL TO ENFORCE IT.
APPENDIX CHAPTER 11
DIVISION II
AMERICANS WITH DISABILITIES ACT

GUIDELINES FOR READILY ACHIEVABLE BARRIER REMOVAL

WAC 51-30-93116 Section 93116.

Section 93116.1 Purpose. The purpose of this division is to provide the United States Department of Justice, Americans with Disabilities Act Guidelines for readily achievable barrier removal in existing buildings.

93116.2 Scope.

93116.2.1 General. The provisions of this division may be used as a guideline for the removal of readily achievable barriers to accessibility in existing buildings, as required by the Americans with Disabilities Act of 1990.

93116.2.2 Applicability of Other Provisions. Except as specifically allowed by this division, all buildings and portions thereof shall meet all applicable provisions of this code.

93116.3 Definitions. For the purpose of this division, certain terms are defined as follows:

COMMERCE is travel, trade, traffic, commerce, transportation, or communication—

1. Among the several States;
2. Between any foreign country or any territory or possession and any State; or
3. Between points in the same State but through another State or foreign country.

COMMERCIAL FACILITIES are facilities—

1. Whose operations will affect commerce;
2. That are intended for nonresidential use by a private entity; and
3. That are not—

3.1. Facilities that are covered or expressly exempted from coverage under the Fair Housing Act of 1968, as amended (42 U.S.C. 3601-3631);

3.2 Aircraft; or

3.3. Railroad locomotives, railroad freight cars, railroad cabooses, commuter or intercity passenger rail cars (including coaches, dining cars, sleeping cars, lounge cars, and food service cars), any other railroad cars described in Section 242 of the American's with Disabilities Act or covered under title II of the American's with Disabilities Act, or railroad rights-of-way. For purposes of this definition, "rail" and "railroad" have the meaning given the term "railroad" in Section 202(e) of the Federal Railroad Safety Act of 1970 (46 U.S.C. 431(e)).

PLACE OF PUBLIC ACCOMMODATION is a facility, operated by a private entity, whose operations affect commerce and fall within at least one of the following categories—

1. An inn, hotel, motel, or other place of lodging, except for an establishment located within a building that contains not more than five rooms for rent or hire and that is actually occupied by the proprietor of the establishment as the residence of the proprietor;
2. A restaurant, bar, or other establishment serving food or drink;

3. A motion picture house, theater, concert hall, stadium, or other place of exhibition or entertainment;

4. An auditorium, convention center, lecture hall, or other place of public gathering;

5. A bakery, grocery store, clothing store, hardware store, shopping center, or other sales or rental establishment;

6. A laundromat, dry-cleaner, bank, barber shop, beauty shop, travel service, shoe repair service, funeral parlor, gas station, office of an accountant or lawyer, pharmacy, insurance office, professional office of a health care provider, hospital, or other service establishment;

7. A terminal, depot, or other station used for specified public transportation;

8. A museum, library, gallery, or other place of public display or collection;

9. A park, zoo, amusement park, or other place of recreation;

10. A nursery, elementary, secondary, undergraduate, or postgraduate private school, or other place of education;

11. A day care center, senior citizen center, homeless shelter, food bank, adoption agency, or other social service center establishment; and

12. A gymnasium, health spa, bowling alley, golf course, or other place of exercise or recreation.

PRIVATE ENTITY is a person or entity other than a public entity.

PUBLIC ACCOMMODATION is a private entity that owns, leases (or leases to), or operates a place of public accommodation.

PUBLIC ENTITY is—

1. Any State or local government;

2. Any department, agency, special purpose district, or other instrumentality of a State or States or local government; and

3. The National Railroad Passenger Corporation, and any commuter authority (as defined in Section 103(8) of the Rail Passenger Service Act).

READILY ACHIEVABLE is easily accomplishable and able to be carried out without much difficulty or expense. In determining whether an action is readily achievable, factors to be considered include—

1. The nature and cost of the action needed under this part;

2. The overall financial resources of the site or sites involved in the action; the number of persons employed at the site; the effect on expenses and resources, or the impact otherwise of the action upon the operation of the site;

3. The overall financial resources of any parent corporation or entity; the overall size of the parent corporation or entity with respect to the number of its employees; the number, type, and location of its facilities;

4. The type of operation or operations of the parent corporation or entity, including the composition, structure, and functions of the workforce of the parent corporation or entity; and

5. The geographic separateness, and the administrative or fiscal relationship of the site or sites in question to the parent corporation or entity.

93116.4 Removal of Barriers. A public accommodation shall remove architectural barriers in existing facilities, including communication barriers that are structural in nature, where such removal is readily achievable, i.e., easily accomplishable and able to be carried out without much difficulty or expense.

93116.5 Examples. Examples of steps to remove barriers include, but are not limited to, the following actions:

1. Installing ramps;

2. Making curb cuts in sidewalks and entrances;

3. Lowering shelves;

4. Rearranging tables, chairs, vending machines, display racks, and other furniture;

5. Lowering telephones;

6. Adding raised letter markings on elevator control buttons;

7. Installing flashing alarm lights;

8. Widening doors;

9. Installing offset hinges to widen doorways;

10. Eliminating a turnstile or providing an alternative accessible path;

11. Installing accessible door hardware;

12. Installing grab bars in toilet stalls;

13. Rearranging toilet partitions to increase maneuvering space;

14. Insulating lavatory pipes;

15. Installing a raised toilet seat;

16. Installing a full-length bathroom mirror;

17. Lowering the paper towel dispenser in a bathroom;

18. Creating a designated accessible parking space;

19. Installing an accessible paper cup dispenser at an existing inaccessible water fountain;

20. Removing high pile, low density carpeting; or

21. Modifying vehicle hand controls.

93116.6 Priorities. A public accommodation shall take measures to comply with the barrier removal requirements of this section in accordance with the following order of priorities:

1. First, a public accommodation shall take measures to provide access to a place of public accommodation from public sidewalks, parking, or public transportation. These measures include, for example, installing an entrance ramp, widening entrances, and providing accessible parking spaces.

2. Second, a public accommodation shall take measures to provide access to those areas of a place of public accommodation where goods and services are made available to the public. These measures include, for example, adjusting the layout of display racks, rearranging tables, widening doors, and installing ramps.

3. Third, a public accommodation shall take measures to provide access to restroom facilities in places of public accommodation where restroom facilities are used by the public on more than an incidental basis. These measures include, for example, removal of obstructing furniture or vending machines, widening of doors, installations of ramps, providing accessible signage, widening of toilet stalls, and installations of grab bars.

4. Fourth, a public accommodation shall take any other measures necessary to provide access to the goods, services,

facilities, privileges, advantages, or accommodations of a place of public accommodation.

93116.7 Relationship to Alterations Requirements of Chapter 11, Part III of this Code. Measures taken solely to comply with the barrier removal requirements of this section are not required to conform to the requirements for alterations in Chapter 11, Part III of this code. These measures include, for example, installing a ramp with a steeper slope or widening a doorway to a narrower width than that required by Chapter 11, Part III of this code. No measure shall be taken, however, that poses a significant risk to the health or safety of individuals with disabilities or others. Barrier removal is required to conform to the Americans with Disabilities Act requirements for existing buildings.

93116.8 Portable Ramps. Portable ramps should be used to comply with this division only when installation of a permanent ramp is not readily achievable. In order to avoid any significant risk to the health or safety of individuals with disabilities or others in using portable ramps, due consideration shall be given to safety features such as nonslip surfaces, railings, anchoring, and strength of materials.

93116.9 Interpretation of Readily Achievable.

93116.9.1 The rearrangement of temporary or movable structures, such as furniture, equipment, and display racks is not readily achievable to the extent that it results in a significant loss of selling or serving space.

93116.10 Alternatives to Barrier Removal.

93116.10.1 General. Where a public accommodation can demonstrate that barrier removal is not readily achievable, a public accommodation shall not fail to make its goods and services, facilities, privileges, advantages, or accommodations available through alternative methods, if those methods are readily achievable.

93116.10.2 Examples. Examples of alternatives to barrier removal include, but are not limited to, the following actions:

1. Providing curb service or home delivery;
2. Retrieving merchandise from inaccessible shelves or racks;
3. Relocating activities to accessible locations;
4. Providing refueling service at inaccessible self-service gas stations.

93116.11 Personal Devices and Services. This section does not require a public accommodation to provide its customers, clients, or participants with personal devices, such as wheelchairs, or services of a personal nature including assistance in eating, toileting, or dressing.

93116.12 Multiscreen Cinemas. If it is not readily achievable to remove barriers to provide access by persons with mobility impairments to all of the theaters of a multiscreen cinema, the cinema shall establish a film rotation schedule that provides reasonable access for individuals who use wheelchairs to all films. Reasonable notice shall be provided to the public as to the location and time of accessible showings.

93116.13 Readily Achievable and Undue Burden: Factors to be Considered. In determining whether an action is readily achievable or would result in an undue burden, factors to be considered include:

1. The nature and cost of the action needed under this part;
2. The overall financial resources of the site or sites involved in the action; the number of persons employed at the site; the effect on expenses and resources, or the impact otherwise of the action upon the operation of the site;
3. The overall financial resources of any parent corporation or entity; the overall size of the parent corporation or entity with respects to the number of its employees; the number, type, and location of its facilities;
4. The type of operation or operations of the parent corporation or entity, including the composition, structure, and functions of the workforce of the parent corporation or entity; and
5. The geographic separateness, and the administrative or fiscal relationship of the site or sites in question to the parent corporation or entity.

93116.14 Accessible or Special Goods.

93116.14.1 This part does not require a public accommodation to alter its inventory to include accessible or special goods that are designed for, or facilitate use by, individuals with disabilities.

93116.14.2 A public accommodation shall order accessible or special goods at the request of an individual with disabilities, if, in the normal course of its operation, it makes special orders on request for unstocked goods, and if the accessible or special goods can be obtained from a supplier with whom the public accommodation customarily does business.

93116.14.3 Examples of accessible or special goods include items such as Braille versions of books, books on audio cassettes, closed-captioned video tapes, special sizes or lines of clothing, and special foods to meet particular dietary needs.

93116.15 Seating in Assembly Areas. To the extent that it is readily achievable, a public accommodation shall:

1. Provide a reasonable number of wheelchair seating spaces in assembly areas; and,
2. Locate the wheelchair seating spaces so that they:
2.1. Are dispersed throughout the seating area;
2.2. Provide lines of sight comparable to those in all viewing areas;
2.3. Adjoin an accessible route of travel that also serves as a means of egress in case of emergency; and,
2.4. Permit individuals who use wheelchairs to sit with family members or other companions.

EXCEPTION: If removal of seats is not readily achievable, a public accommodation shall provide a portable chair or other means to permit a family member or other companion to sit with an individual who uses a wheelchair.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-93116, filed 12/21/94, effective 6/30/95.]

THIS APPENDIX IS FOR REFERENCE ONLY. IT IS NOT THE RESPONSIBILITY OF THE BUILDING OFFICIAL TO ENFORCE IT.
APPENDIX CHAPTER 11
DIVISION III
AMERICANS WITH DISABILITIES ACT
ALTERNATE GUIDELINES FOR DETECTABLE WARNINGS

WAC 51-30-93117 Section 93117.

Section 93117.1 General. The purpose of this division is to provide additional design guidelines for construction and installation of truncated domes as required by the Americans with Disabilities Act of 1990.

93117.2 Raised Truncated Domes. Raised truncated domes shall have a diameter of 0.9 inches (23 mm) nominal, a height of 0.2 inches (5 mm) nominal and a center-to-center spacing of 2.35 inches (60 mm) nominal. Raised truncated domes shall comply with Appendix Chapter 11, Division VI for visual contrast.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-93117, filed 12/21/94, effective 6/30/95.]

THIS APPENDIX IS FOR REFERENCE ONLY. IT IS NOT THE RESPONSIBILITY OF THE BUILDING OFFICIAL TO ENFORCE IT.
APPENDIX CHAPTER 11
DIVISION IV
AMERICANS WITH DISABILITIES ACT
ALTERNATE GUIDELINES FOR AUDIBLE ALARMS

WAC 51-30-93118 Section 93118.

Section 93118.1 Purpose. The purpose of this division is to provide the United States Department of Justice, Americans with Disabilities Act Guidelines for audible alarms.

93118.2 Audible Alarms. Audible alarms shall exceed the prevailing equivalent sound level in the room or space by at least 15 decibels, or shall exceed any maximum sound level with a duration of 30 seconds by 5 decibels, whichever is louder. Sound levels for alarm signals shall not exceed 120 decibels.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-93118, filed 12/21/94, effective 6/30/95.]

THIS APPENDIX IS FOR REFERENCE ONLY. IT IS NOT THE RESPONSIBILITY OF THE BUILDING OFFICIAL TO ENFORCE IT.
APPENDIX CHAPTER 11
DIVISION V
AMERICANS WITH DISABILITIES ACT
ALTERNATE GUIDELINES FOR VISUAL CONTRAST

WAC 51-30-93119 Section 93119.

Section 93119.1 Purpose. The purpose of this division is to provide the United States Department of Justice, Americans with Disabilities Act Guidelines for visual contrast.

93119.2 Guidelines for Visual Contrast.

93119.2.1 Raised truncated domes. Raised truncated domes used as detectable warnings shall contrast visually by 70 percent with adjoining surfaces. Contrast in percent shall be determined as follows:

$$\text{Contrast} = [(B^1 - B^2)/B^1] \times 100$$

Where: B^1 = light reflectance value (LRV) of the lighter area; and,
B^2 = light reflectance value (LRV) of the darker area.

The material used to provide contrast shall be an integral part of the walking surface.

93119.2.2 Signage. The characters and background of signs shall be eggshell (11 to 19 degree gloss on 60 degree glossimeter). Characters shall be light on a dark background (or dark on a light background) and contrast with their background by at least 70 percent. Contrast in percent shall be determined as follows:

$$\text{Contrast} = [(B^1 - B^2)/B^1] \times 100$$

Where: B^1 = light reflectance value (LRV) of the lighter area; and,
B^2 = light reflectance value (LRV) of the darker area.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-93119, filed 12/21/94, effective 6/30/95.]

THIS APPENDIX IS FOR REFERENCE ONLY. IT IS NOT THE RESPONSIBILITY OF THE BUILDING OFFICIAL TO ENFORCE IT.
APPENDIX CHAPTER 11
DIVISION VI
AMERICANS WITH DISABILITIES ACT
GUIDELINES
FOR AUTOMATED TELLER MACHINES

WAC 51-30-93120 Section 93120.

Section 93120.1 Purpose. The purpose of this division is to provide the United States Architectural and Transportation Barriers Compliance Board Americans with Disabilities Act Guidelines for automated teller machines.

93120.2 Accessible buildings: Automated teller machines. Where automated teller machines are provided, each machine shall comply with the requirements below except where two or more machines are provided at a location, then only one must comply.

EXCEPTION: Drive-up-only automated teller machines are not required to comply with 93120.4 and 93120.5.

93120.3 General. Each automated teller machine required to be accessible by 93120.2 shall be on an accessible route and shall comply with the provisions of the section.

93120.4 Clear floor space. The automated teller machine shall be located so that clear floor space complying with

1106.2.4.1, 1106.2.4.2, 1106.2.4.3 and 1106.2.4.4 is provided to allow a person using a wheelchair to make a forward approach, a parallel approach, or both, to the machine.

93120.5 Reach ranges.

1. **Forward approach only.** If only a forward approach is possible, operable parts of all controls shall be placed within the forward reach range specified in 1106.2.4.5.

2. **Parallel approach only.** If only a parallel approach is possible, operable parts of controls shall be placed as follows:

2.1 Reach Depth Not More Than 10 inches (255 mm). Where the reach depth to the operable parts of all controls as measured from the vertical plane perpendicular to the edge of the unobstructed clear space at the farthest protrusion of the automated teller machine or surround is not more than 10 inches (255 mm), the maximum height above the finished floor or grade shall be 54 inches (1370 mm).

2.2 Reach Depth More Than 10 inches (255 mm). Where the reach depth to the operable parts of any control as measured from the vertical plane perpendicular to the edge of the unobstructed clear floor space at the farthest protrusion of the automated teller machine or surround is more than 10 inches (255 mm), the maximum height above the finished floor or grade shall be as follows:

Reach Depth		Maximum Height	
Inches	Mm	Inches	Mm
10	255	54	1370
11	280	53½	1360
12	305	53	1345
13	330	52½	1335
14	355	51½	1310
15	380	51	1295
16	405	50½	1285
17	430	50	1270
18	455	49½	1255
19	485	49	1245
20	510	48½	1230
21	535	47½	1205
22	560	47	1195
23	585	46½	1180
24	610	46	1170

3. **Forward and parallel approach.** If both a forward and parallel approach are possible, operable parts of controls shall be placed within at least one of the reach ranges in paragraphs (1) and (2) of this section.

4. **Bins.** Where bins are provided for envelopes, waste paper, or other purposes, at least one of each type provided shall comply with the applicable reach ranges in paragraph (1), (2), or (3) of this section.

EXCEPTION: Where a function can be performed in a substantially equivalent manner by using an alternate control, only one of the controls needed to perform that function is required to comply with this section. If the controls are identified by tactile markings, such markings shall be provided on both controls.

93120.6 Controls. Controls for user activation shall comply with 1106.3.

93120.7 Equipment for persons with vision impairments. Instructions and all information for use shall be made accessible to and independently usable by persons with vision impairments.

[Statutory Authority: Chapters 19.27 and 70.92 RCW. 95-01-129, § 51-30-93120, filed 12/21/94, effective 6/30/95.]

Chapter 51-32 WAC
STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1994 EDITION OF THE UNIFORM MECHANICAL CODE
(Formerly chapter 51-22 WAC)

WAC

WAC 51-32-001 Authority. These rules are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-001, filed 12/21/94, effective 6/30/95.]

WAC 51-32-002 Purpose. The purpose of these rules is to implement the provisions of chapter 19.27 RCW, which provides that the State Building Code Council shall maintain the State Building Code in a status which is consistent with the purpose as set forth in RCW 19.27.020. In maintaining the codes the Council shall regularly review updated versions of the codes adopted under the act, and other pertinent information, and shall amend the codes as deemed appropriate by the Council.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-002, filed 12/21/94, effective 6/30/95.]

WAC 51-32-003 Uniform Mechanical Code. The 1994 edition of the Uniform Mechanical Code, including Chapter 13, Fuel-Gas Piping, Appendix B, published by the International Conference of Building Officials is hereby adopted by reference with the exceptions noted in this chapter of the Washington Administrative Code.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-003, filed 12/21/94, effective 6/30/95.]

WAC 51-32-004 Conflict between Uniform Mechanical Code and State Energy Code chapter 51-11 WAC. In the case of conflict between the duct sealing or insulation requirements of Section 601 or Section 604 of this code and the duct sealing or insulation requirements of chapter 51-11 WAC, the Washington State Energy Code, or where applicable, a local jurisdiction's energy code, the provisions of such energy codes shall govern.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-004, filed 12/21/94, effective 6/30/95.]

WAC 51-32-005 Conflict between Uniform Mechanical Code and State Ventilation and Indoor Air Quality Code chapter 51-13 WAC. In the case of conflict between the Group R ventilation requirements of this code and the Group R ventilation requirements of chapter 51-13 WAC, the Washington State Ventilation and Indoor Air Quality Code, the provisions of the ventilation and indoor air quality code shall govern.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-005, filed 12/21/94, effective 6/30/95.]

WAC 51-32-007 Exceptions. The exceptions and amendments to the Uniform Mechanical Code contained in the provisions of chapter 19.27 RCW shall apply in case of conflict with any of the provisions of these rules.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-007, filed 12/21/94, effective 6/30/95.]

WAC 51-32-008 Implementation. The Uniform Mechanical Code adopted by chapter 51-32 WAC shall become effective in all counties and cities of this state on June 30, 1995.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-008, filed 12/21/94, effective 6/30/95.]

WAC 51-32-0200 Chapter 2—Definitions.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0200, filed 12/21/94, effective 6/30/95.]

WAC 51-32-0223 Section 223—U.

U.B.C. STANDARDS are those standards published in Volume 3 of the *Uniform Building Code* promulgated by the International Conference of Building Officials, as adopted by this jurisdiction.

UNCONFINED SPACE is a room or space having a volume equal to at least 50 cubic feet per 1,000 Btu/h (4.831 L/W) of the aggregate input rating of all fuel-burning appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through openings not furnished with doors, are considered a part of the unconfined space.

UNIT HEATER is a heating appliance designed for nonresidential space heating and equipped with an integral means for circulation of air.

UNUSUALLY TIGHT CONSTRUCTION is construction where:

1. Walls and ceilings exposed to the outside atmosphere have a continuous water vapor retarder with a rating of one perm or less with any openings gasketed or sealed, and
2. Weatherstripping on openable windows and doors, and
3. Caulking or sealants are applied to areas such as joints around window and door frames, between sole plates

and floors, between wall-ceiling joints, between wall panels and at penetrations for plumbing, electrical and gas lines and at other openings, or

4. Buildings built in compliance with the 1986 or later editions of the Washington State Energy Code (WAC 51-11), Northwest Energy Code, or Super Good Cents weatherization standards or equivalent.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0223, filed 12/21/94, effective 6/30/95.]

WAC 51-32-0300 Chapter 3—General requirements for heating, ventilating and cooling.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0300, filed 12/21/94, effective 6/30/95.]

PART III—DECORATIVE APPLIANCES, FLOOR FURNACES, VENTED WALL FURNACES, UNIT HEATERS AND ROOM HEATERS

WAC 51-32-0327 Section 327—Room heaters and unvented decorative gas logs and fireplaces.

327.1 Vented Freestanding. Vented freestanding room heaters shall be installed with clearances from combustible material as set forth in Table 3-A.

EXCEPTION: Heaters listed for reduced clearances may be installed at the clearances specified on the required manufacturer's label.

327.2 Door Swing. Vented freestanding room heaters shall not be located so that a door can swing within less than 12 inches (305 mm) of a warm-air outlet of the heater, measured at right angles to the outlet. Doorstops or door closers shall not be installed to obtain such clearance.

327.3 Clearance. Vented freestanding room heaters shall be located at least 36 inches (914 mm) below any part of a structure projecting over the heater. This projection shall include doors or windows that could project over the heater.

327.4 Installation. Vented freestanding room heaters shall be safely and securely installed to prevent accidental displacement.

327.5 Vented Overhead. Vented overhead room heaters shall be safely and securely supported with hangers and brackets of noncombustible material and shall be installed with clearances from combustible material as specified on the required manufacturer's label.

EXCEPTION: Installation of overhead heaters in aircraft storage or servicing areas of Group S, Division 5 Occupancies shall comply with requirements of Section 323.1.

327.6 Unvented. Unvented fuel-burning room heaters shall not be installed, used, maintained or permitted to exist in a Group I or R Occupancy nor shall an unvented heater be installed in any building, whether as a new or as a replacement installation, unless permitted by this section. This subsection shall not apply to portable oil-fired unvented heating appliances used as supplemental heating in Group S, Divisions 3, 4 and 5 Occupancies, and Group U Occupancies, and regulated by the Fire Code.

Approved, unvented portable oil-fueled heaters may be used as a supplemental heat source in any Group B, F-2, M, R or U Occupancy provided that such heaters shall not be located in any sleeping room or bathroom, and shall comply with RCW 19.27A.080, 19.27A.090, 19.27A.100, 19.27A.110 and 19.27A.120.

Approved, unvented decorative gas logs and decorative fireplaces may be installed, used, maintained and permitted to exist in any Group I or R Occupancy, except bathrooms and bedrooms. An unvented decorative gas log is a listed natural or liquefied petroleum gas burning log with an open flame consisting of a metal frame or base supporting simulated logs which is designed so that its primary function lies in the aesthetic effect of the logs and flame. An unvented decorative fireplace is a listed unvented gas log permanently installed in a freestanding enclosure or zero clearance enclosure designed and approved for installation in walls or other building structures. Unvented decorative gas logs and fireplaces shall:

1. Be equipped with an approved oxygen-depletion sensor,
2. Be listed,
3. Not be installed in any room which does not have an alternative primary source of heat,
4. Have free air volume of at least 50 cubic feet (1.4 m^3) for each 1,000 Btu (2.2 mm^2/W) of thermal output,
5. Be permanently installed, and
6. Not be equipped with or connected to any automatic ignition or shut-off device except the oxygen-depletion sensor.

327.7 Overhead Radiant Heaters. Listed or approved unvented overhead room heaters may be installed in Group A, Division 2, 2.1, 3 or 4; Groups B; H, Division 4; Group H, Division 5; or Group U Occupancy, provided the installation conforms to all of the following requirements:

1. All portions of the heater are located at least 8 feet (2438 mm) above the floor.

2. At least two unobstructed permanent openings are provided to the room or space containing such heaters. These openings shall open directly to the outside of the building through the floor, roof or wall. The minimum combined total area of these openings shall be at least 1 square inch for each 1,000 Btu/h (2.2 mm^2/W) input of the heater or heaters, with a minimum total area of 100 square inches (0.0645 m^2). One half of the required openings shall be above the heater or heaters and one half shall be located below the heater or heaters.

EXCEPTION: When approved by the building official, provisions may be made to exhaust the products of combustion to the exterior by mechanical means.

3. Heaters shall be safely and securely supported with hangers and brackets of noncombustible material and installed with clearances from combustible material as specified on the required manufacturer's label.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0327, filed 12/21/94, effective 6/30/95.]

WAC 51-32-0500 Chapter 5—Exhaust systems.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0500, filed 12/21/94, effective 6/30/95.]

WAC 51-32-0504 Section 504—Environmental air ducts.

504.1 Makeup and Exhaust Air Ducts. Environmental air ducts not regulated by other provisions of this code shall comply with this section. Ducts shall be substantially airtight and shall comply with the provisions of Chapter 6. Exhaust ducts shall terminate outside the building and shall be equipped with backdraft dampers. Environmental air ducts which have an alternate function as a part of an approved smoke-control system do not require design as Class I product-conveying ducts.

504.2 Domestic Range Vents. Ducts used for domestic kitchen range ventilation shall be of metal and shall have smooth interior surfaces.

EXCEPTION: Ducts for domestic kitchen downdraft grill-range ventilation installed under a concrete slab floor may be of approved Schedule 40 PVC provided:
1. The under-floor trench in which the duct is installed shall be completely backfilled with sand or gravel.
2. Not more than 1 inch (25 mm) of 6-inch-diameter (152 mm) PVC coupling may protrude above the concrete floor surface.
3. PVC pipe joints shall be solvent cemented to provide an air- and grease-tight duct.
4. The duct shall terminate above grade outside the building and shall be equipped with a backdraft damper.

504.3 Domestic Dryer Vent. Domestic clothes dryer moisture exhaust ducts shall be of metal and shall have smooth interior surfaces.

EXCEPTION: Approved flexible duct connectors not more than 6 feet in length may be used in connection with domestic dryer exhausts. Flexible duct connectors shall not be concealed within construction.

504.3.1 Moisture exhaust ducts. Moisture exhaust ducts for domestic clothes dryers shall terminate on the outside of the building and shall be equipped with a back-draft damper. Screens shall not be installed at the duct termination. Ducts for exhausting clothes dryers shall not be connected or installed with sheet metal screws or other fasteners which will obstruct the flow. Clothes dryer moisture exhaust ducts shall not be connected to a gas vent connector, gas vent or chimney. Clothes dryer moisture exhaust ducts shall not extend into or through ducts or plenums. Clothes dryer exhaust ducts shall be protected by a steel plate or clip not less than 1/16 inch (1.59 mm) in thickness and of sufficient width to fully protect the duct. Plates or clips shall be placed on the finish face of all framing members which the clothes dryer exhaust duct passes through when there is less than 1-1/4 inch (32 mm) of framing material between the duct and the finish face. Plates or clips shall also be placed where nails or screws from finish or other work are likely to penetrate the clothes dryer exhaust duct.

504.3.2 Length limitation. Unless otherwise permitted or required by the dryer manufacturer's installation instructions and approved by the building official, domestic dryer moisture exhaust ducts shall not exceed a total combined horizontal and vertical length of 14 feet (4267 mm), including two 90-degree elbows. Two feet (610 mm) shall be deducted for each 90-degree elbow in excess of two.

504.4 Commercial Dryer Exhaust Systems. Commercial dryer moisture exhaust ducts shall be installed in accordance with their listing.

504.5 Gypsum Wallboard Ducts. Bathroom and laundry room exhaust ducts may be of gypsum wallboard subject to the limitations of Section 601.1.3.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0504, filed 12/21/94, effective 6/30/95.]

WAC 51-32-0600 Chapter 6—Duct systems.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0600, filed 12/21/94, effective 6/30/95.]

WAC 51-32-0601 Section 601—Scope. Ducts and plenums which are portions of a heating, cooling, absorption or evaporative cooling system shall comply with the requirements of this chapter.

601.1 Material. Supply air, return air and outside air for heating, cooling or evaporative cooling systems shall be conducted through duct systems constructed of metal as set forth in Tables 6-A, 6-B and 6-C; metal ducts complying with the U.M.C. Standard 6-2 with prior approval; or factory-made air ducts complying with U.M.C. Standard 6-1. Ducts, plenums and fittings may be constructed of concrete, clay, ceramics or other approved nonmetallic materials when installed in the ground or in a concrete slab, provided the joints are tightly sealed.

601.1.1 Use of corridor as plenum. Corridors shall not be used to convey air to or from rooms if the corridor is required to be of fire-resistive construction by Section 1005 of the Building Code.

EXCEPTIONS: 1. Where such air is part of an engineered smoke control system.
2. Corridors conforming to Section 1019.3 of the Uniform Building Code in Group I Occupancies.
3. Corridors serving residential occupancies may be supplied without specific mechanical exhaust subject to the following:
3.1 The supply air is 100 percent outside air, and
3.2 The units served by the corridor have conforming ventilation independent of the air supplied to the corridor, and
3.3 For other than high-rise buildings, the supply fan will automatically shut off upon activation of corridor smoke detectors which shall be spaced at no more than 30 feet (9144 mm) on center along the corridor, and
3.4 For high-rise buildings, corridor smoke detector activation will close required smoke/fire dampers at the supply inlet to the corridor at the floor receiving the alarm.

601.1.2 Use of concealed space as plenum. Concealed building spaces or independent construction within buildings may be used as ducts or plenums.

601.1.3 Gypsum products exposed in ducts. When gypsum products are exposed in ducts or plenums, the air temperature shall be restricted to a range from 50°F. to 125°F. (10°C. to 50°C.) and moisture content shall be controlled so that the material is not adversely affected. For the purpose of this section, gypsum products shall not be exposed in ducts serving as supply from evaporative coolers, and in other air-handling systems regulated by this chapter

when the temperature of the gypsum product will be below the dew point temperature.

See Chapter 8 for limitations on combustion products venting systems extending into or through ducts or plenums.

See Chapter 5 for limitations on environmental air systems exhaust ducts extending into or through ducts or plenums.

601.2 Contamination Prevention. Exhaust ducts under positive pressure and venting systems shall not extend into or pass through ducts or plenums. For appliance vents and chimneys, see Chapter 8.

EXCEPTION: Exhaust ducts conveying environmental air may pass through a duct or plenum provided that:
1. The duct is maintained under sufficient negative pressure to prevent leakage of the exhaust air to the surrounding duct or plenum; or
2. If maintained under a positive pressure with respect to the surrounding duct or plenum, the exhaust duct will be sealed to prevent leakage; or
3. The surrounding air stream is an exhaust air stream not intended for recirculation to the building and cross contamination of the two air streams will not create a hazardous condition.

601.3 Combustibles within Ducts or Plenums. Materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke-developed rating of not more than 50 when tested in accordance with the test for Surface Burning Characteristics of Building Materials, U.B.C. Standard 8-1.

EXCEPTIONS: 1. Return-air and outside-air ducts, plenums or concealed spaces which serve a dwelling unit may be of combustible construction.
2. Air filters meeting the requirements of Section 403.
3. Water evaporation media in an evaporative cooler.
4. Charcoal filters when protected with an approved fire-suppression system.
5. Electrical wiring in plenums shall comply with the Electrical Code. Flame propagation and smoke production characteristics of exposed electric cables installed in concealed space used as air plenums shall:
5.1 Exhibit a flame travel of 5 feet or less, and
5.2 Produce smoke having an average optical density not greater than 0.15 and having a peak optical density of 0.5 or less when tested in accordance with U.M.C. Standard 6-3.
5.3 Wiring meeting these requirements shall be listed and labeled as plenum cable as required by the Electrical Code.
6. Nonmetallic fire sprinkler piping in plenums shall be listed and shall meet the following requirements:
6.1 Exhibit flame travel of 5 feet (1524 mm) or less, and
6.2 Produce smoke having an average optical density not greater than 0.15 and having a peak optical density of 0.5 or less when tested in accordance with U.M.C. Standard 6-3.

601.4 Factory-made Air Ducts. Factory-made air ducts shall be approved for the use intended or shall conform to the requirements of U.M.C. Standard 6-1. Each portion of a factory-made air duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with U.M.C. Standard 6-1 and its class designation. These ducts shall be listed and shall be installed in accordance with the terms of their listing, and the requirements of U.M.C. Standard 6-1.

601.5 Joints and Seams of Ducts. Joints of duct systems shall be made substantially airtight by means of tapes, mastics, gasketing or other means.

601.5.1 Residential round ducts. Crimp joints for residential round ducts shall have a contact lap of at least 1-1/2 inches (38 mm) and shall be mechanically fastened by means of at least three sheet-metal screws equally spaced around the joint, or an equivalent fastening method.

601.5.2 Residential rectangular ducts. Joints and seams for 0.016-inch (0.41 mm) (No. 28 gage) and 0.013-inch (0.33 mm) (No. 30 gage) residential rectangular ducts shall be as specified in Table 6-A for 0.019-inch (0.48 mm) (No. 26 gage) material.

601.5.3 Rectangular ducts. Joints and seams for rectangular duct systems shall be as specified in Table 6-A.

601.5.4 Oval ducts. Joints and seams for flat oval ducts and round ducts in other than single dwelling units shall be as specified in Table 6-B.

601.5.5 Listed duct. Joints and seams and all reinforcements for factory-made air ducts and plenums shall meet with the conditions of prior approval in accordance with the installation instructions that shall accompany the product.

601.6 Metal. Every duct, plenum or fitting of metal shall comply with Table 6-A or Table 6-B.

EXCEPTIONS: 1. Ducts, plenums and fittings for systems serving single-dwelling units may comply with Table 6-C.
2. Duct systems complying with U.M.C. Standard 6-1.

601.7 Tinned Steel. Existing tinned steel ducts may be used when cooling coils are added to a heating system, provided the first 10 feet (3048 mm) of the duct or plenum measured from the cooling coil discharge are constructed of metal of the gage thickness set forth in Table 6-A, 6-B or 6-C of this chapter or are of approved material and construction. Tinned ducts completely enclosed in inaccessible concealed areas need not be replaced. All accessible ducts shall be insulated to comply with Table 6-D of this chapter. For the purpose of this subsection, ducts shall be considered accessible if the access space is 30 inches (762 mm) or greater in height.

601.8 Vibration Isolators. Vibration isolators installed between mechanical equipment and metal ducts (or casings) shall be made of an approved material and shall not exceed 10 inches (254 mm) in length.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0601, filed 12/21/94, effective 6/30/95.]

WAC 51-32-0605 Section 605—Dampers in duct systems.

605.1 Smoke Dampers. Smoke dampers complying with recognized standards in Chapter 16, Part III, shall be installed in accordance with approved manufacturer's installation instructions when required by Chapters 7 and 9 of the Building Code. Smoke dampers shall be labeled by an approved agency.

605.2 Fire Dampers. Fire dampers complying with recognized standards in Chapter 16, Part III, shall be installed in accordance with approved manufacturer's installa-

tion instructions when required by Chapter 7 of the Building Code. Fire dampers shall have been tested for closure under airflow conditions and shall be labeled for both maximum airflow permitted and direction of flow. When more than one damper is installed at a point in a single air path, the entire airflow shall be assumed to be passing through the smallest damper area. Fire dampers shall be labeled by an approved agency. Only fire dampers labeled for use in dynamic systems shall be installed in heating, ventilation and air-conditioning systems which are intended to operate with fans "on" during a fire; see U.B.C. Section 713.12.

EXCEPTION: Fire dampers need not be installed in air ducts passing through the wall, floor or ceiling separating a Group R, Division 3 Occupancy from a Group U Occupancy, provided such ducts within the Group U Occupancy are constructed of steel having a thickness not less than 0.019 inch (0.48 mm) (No. 26 galvanized sheet gage) and have no openings into the Group U Occupancy.

Ductwork shall be connected to damper sleeves or assemblies in such a way that collapse of the ductwork will not dislodge the damper or impair its proper operation.

605.3 Ceiling Dampers. Ceiling dampers complying with recognized standards in Chapter 16, Part III, shall be installed in accordance with manufacturer's approved installation instructions in the fire-resistive ceiling element of floor-ceiling and roof-ceiling assemblies when required by Chapter 7 of the Building Code. Fire dampers not meeting the temperature limitation of ceiling dampers shall not be used as substitutes. Ceiling dampers shall be labeled by an approved agency.

605.4 Multiple Arrangements. When size requires the use of multiple dampers, the installation shall be framed in an approved manner to ensure that the dampers remain in place.

605.5 Access and Identification. Dampers shall be provided with an approved means of access, large enough to permit inspection and maintenance of the damper and its operating parts. The access shall not impair fire-resistive construction. Access shall not require the use of tools, keys or special knowledge. Access points shall be permanently identified on the exterior by a label with letters not less than 1/2 inch (13 mm) in height reading: SMOKE DAMPER or FIRE DAMPER. Access doors in ducts shall be tightfitting and suitable for the required duct construction.

605.6 Freedom from Interference. Dampers shall be installed in a manner to ensure positive closing or opening as required by function. Interior liners or insulation shall be held back from portions of a damper, its sleeve or an adjoining duct which would interfere with the damper's proper operation. Exterior materials shall be installed so as to avoid interference with the operation or maintenance of external operating devices needed for proper function.

605.7 Temperature Classification of Operating Elements. Fusible links, thermal sensors, and pneumatic or electric operators shall have a temperature rating or classification as required by the Building Code.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-0605, filed 12/21/94, effective 6/30/95.]

WAC 51-32-1100 Refrigeration.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-32-1100, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1101 General.

1101.1 Scope. This chapter shall govern the design, installation, construction and repair of refrigeration systems that vaporize and liquefy a fluid during the refrigerating cycle. Refrigerant piping design and installation, including pressure vessels and pressure relief devices, shall conform to this code. Permanently installed refrigerant storage systems and other components shall be considered as part of the refrigeration system to which they are attached.

1101.2 Factory-built equipment. Listed and labeled self-contained, factory-built equipment shall be tested in accordance with UL 207, 303, 412, 465, 471 or 1995.

1101.3 Protection. Any portion of a refrigeration system that is subject to physical damage shall be protected in an approved manner.

1101.4 Water connection. Water supply and discharge connections associated with refrigeration systems shall be made in accordance with this code and the plumbing code.

1101.5 Gas connection. Gas fuel devices and equipment used with refrigeration systems shall be installed in accordance with this code.

1101.6 General. Refrigeration systems shall comply with the requirements of this code and, except as modified by this code, ASHRAE 15-1994. Ammonia-refrigerating systems shall comply with this code and, except as modified by this code, ASHRAE 15-1994 and IIAR 2-1992.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-32-1101, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1102 System requirements.

1102.1 General. The system classification, allowable refrigerants, the maximum quantity, enclosure requirements, location limitations and field pressure test requirements, shall be determined as follows:

1. Determine the refrigeration system's classification in accordance with Section 1103.
2. Determine the refrigerant classification in accordance with Table 1104.1.
3. Determine the maximum allowable quantity of refrigerant in accordance with Table 1104.2(1), based on type of refrigerant, system classification and occupancy.
4. Determine the system enclosure requirements in accordance with Table 1104.2(1).
5. Refrigeration equipment location and installation shall be subject to the limitations of Chapter 3.
6. Nonfactory-tested, field-erected equipment shall be pressure tested in accordance with Section 1108.

1102.2 Refrigerants. Refrigerants not identified in Table 1104.1 shall be approved before use. Refrigerants (including refrigerant blends) with different designations in ASHRAE

34-1992, with addenda through 1995, shall not be mixed in a system.

1102.2.1 New refrigerants. Refrigerants used in new equipment shall be of a type and purity level specified or approved by the equipment manufacturer.

1102.2.2 Recovered refrigerants. Refrigerants that are recovered from refrigeration and air-conditioning systems shall not be reused in other than the system from which they were recovered and in other systems of the same owner. Recovered refrigerants shall be filtered and dried before reuse. Recovered refrigerants that show clear signs of contamination shall not be reused unless reclaimed in accordance with Section 1102.2.3.

1102.2.3 Reclaimed refrigerants. Used refrigerants shall not be reused in a different owner's equipment unless reclaimed and found to meet the purity requirements of ARI 700-1993. Contaminated refrigerants shall not be used in the same owner's equipment or in a different owner's equipment unless reclaimed and found to meet the purity requirements of ARI 700-1993.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-32-1102, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1103 Refrigeration system classification.

1103.1 General. For the purposes of applying Tables 1104.1, 1104.2(1), and 1104.2(2), refrigeration systems shall be classified as a high-probability or low-probability system based on the potential hazard resulting from a leakage of refrigerant into an occupancy-classified area other than the machinery room.

1103.2 High-probability systems. Direct systems and indirect open-spray systems shall be classified as high-probability systems.

EXCEPTION: An indirect open-spray system shall not be required to be classified as a high-probability system if the pressure of the secondary coolant is at all times (operating and standby) greater than the pressure of the refrigerant.

1103.3 Low-probability systems. Double-indirect open-spray systems, indirect closed systems and indirect-vented closed systems shall be classified as low-probability systems, provided that all refrigerant-containing piping and fittings are isolated when the quantities in Table 1104.1 are exceeded.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-32-1103, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1104 Refrigerant classification and system requirements.

1104.1 Refrigerant classification. Refrigerants shall be classified in accordance with ASHRAE 34-1992, with addenda through 1995, as listed in Table 1104.1.

TABLE 1104.1
REFRIGERANT[a] CLASSIFICATION, AMOUNT[b,c,e] AND TLV-TWA[f]

REFRIGERANT DESCRIPTION			AMOUNT OF REFRIGERANT PER OCCUPIED SPACE			TLV[f] TWA ppm
Refrigerant Classification	Name or Blend	Chemical Formula	Lb per 1,000 ft^3[a]	ppm	g/m^3[c]	
Group A1						
R-11	Trichlorofluoromethane	CCl_3F	1.6	4,000	250	C1,000
R-12	Dichlorodifluoromethane	CCl_2F_2	12	40,000	200	1,000
R-13	Chlorotrifluoromethane	$CClF_3$	18	67,000	290	1,000
R-13B1	Bromotrifluoromethane	$CBrF_3$	22	57,000	350	1,000
R-14	Tetrafluoromethane (Carbon Tetrafluoride)	CF_4	15	67,000	240	1,000
R-22	Chlorodifluoromethane	$CHClF_2$	9.4	42,000	150	1,000
R-113	1,1,2-trichloro-1, 2, 2-trifluoroethane	CCl_2FCClF_2	1.9	4,000	31	1,000
R-114	1,2-dichloro-1, 1, 2, 2-tetrafluoroethane	$RCClF_2CClF_2$	9.4	21,000	150	1,000
R-115	Chloropentafluoroethane	$CClF_2CF_3$	27	67,000	430	1,000
R-134a	1,1,1,2-Tetrafluoroethane	CH_2FCF_3	16	60,000	250	1,000
R-C318	Octafluorocyclobutane	$-CF_2-CF_2-CF_2-CF_2-$	35	67,000	550	1,000
R-400	R-12/R-114	CCL_2F_2/CCl_2FCClF_2	Note d	Note d	Note d	1,000
R-500	R-12/152a(73.8/26.2)	CCl_2F_2/CH_3CHF_2	12	47,000	200	1,000
R-502	R-22/115(48.8/51.2)	$CHClF_2/CClF_2CF_3$	19	65,000	300	1,000
R-503	R-23/13(40.1/59.9)	$CHF_3/CClF_3$	15	67,000	240	1,000
R-744	Carbon Dioxide	CO_2	5.7	50,000	91	5,000
Group A2						
R-142b	1-chloro-1, 1 -Difluoroethane	CH_3CClF_2	3.7	14,000	60	1,000
R-152a	1, 1-Difluoroethane	CH_3CHF_2	1.2	7,000	20	1,000
Group A3[g]						
R-170	Ethane	CH_3CH_3	0.50	6,400	8.0	1,000
R-290	Propane	$CH_3CH_2CH_3$	0.50	4,400	8.0	1,000
R-600	Butane	$CH_3CH_2CH_2CH_3$	0.51	3,400	8.2	800
R-600a	2-Methyl propane (Isobutane)	$CH(CH_3)_2-CH_3$	0.51	3,400	8.2	800
R-1150	Ethene (Ethylene)	$CH_2=CH_2$	0.38	5,200	6.0	1,000
R-1270	Propene (Propylene)	$CH_3CH=CH_2$	037	3,400	5.0	1,000
Group B1						
R-123	2, 2-Dichloro-1, 1, 1-Trifluorethane	$CHCl_2CF_3$	0.4	1,000	6.3	30
R-764	Sulfur Dioxide	SO_2	0.016	100	0.26	2
Group B2						
R-40	Chloromethane (methyl chloride)	CH_3Cl	1.3	10,000	21.0	C50
R-611	Methyl Formate	$HCOOCH_3$	0.78	5,000	12.0	100
R-717	Ammonia	NH_3	0.022	500	0.35	25
Group B3[g]	—	—	—	—	—	—

For SI: 1 pound = 0.454 kg, 1 cubic foot = 0.0283 m^3.

[a] Other refrigerants shall be approved.

[b] To be used only in conjunction with footnotes from Table 1104.2(1).

[c] To correct for height, H (feet), above sea level, multiply these values by $(1 - 2.42 \times 10^{-6}H)$. To correct for height, h (km), above sea level, multiply these values by $(1 - 7.94 \times 10^{-2}h)$. Do not adjust volume percent or TLV-TWA (ppm) for altitude.

[d] The quantity of each component shall comply with the limits set in Table 1104.1 for the pure compound and the total volume percent of all components shall not exceed 6.7 volume percent.

[e] The basis of the table amounts is given as follows:

Group A1 Eighty percent of the cardiac sensitization level for R-11, R-12, R-13B1, R-22, R-113, R-114, R-134a, R-500 and R-502. One-hundred percent of the IDLH for R-744. Others are limited by levels where oxygen deprivation begins to occur.

Group A2, A3 Approximately 20 percent of LFL.

Group B1 One hundred percent of IDLH for R-764, and 100 percent of the measure consistent with the IDLH for R-123.

Group B2, B3 One hundred percent of IDLH or 20 percent of LFL, whichever is lower.

[f] TLV-TWA or measure consistent therewith to be used with Section 1104. The values shown for R-11 and R-40 are TLV-C (TLV-ceiling) values not to be exceeded.

[g] Group A3 and B3 refrigerants as listed in Table 1104.1 shall not be used in a refrigerating system in excess of 1,000 pounds, unless approved by the code official.

1104.2 System requirements. The maximum allowable refrigerant quantities shall be in accordance with Table 1104.2(1). To use Table 1104.2(1), determine the occupancy class, refrigerant group in accordance with Table 1104.1 and type of system in accordance with Section 1103, and then locate the notes that apply.

1104.2.1 Occupancy classification. Locations of refrigerating systems are described by occupancy classifications that

consider the ability of people to respond to potential exposure to refrigerant. Where equipment, other than piping, is located outside a building and within 20 feet (6096 mm) of any building opening, such equipment shall be governed by the occupancy classification of the building. Occupancy classifications shall be defined as follows:

1. Institutional occupancy is that portion of premises from which, because they are disabled, debilitated or confined, occupants cannot readily leave without the assistance of others. Institutional occupancies include, among others, hospitals, nursing homes, asylums and spaces containing locked cells.
2. Public assembly occupancy is that portion of premises where large numbers of people congregate and from which occupants cannot quickly vacate the space. Public assembly occupancies include, among others, auditoriums, ballrooms, classrooms, passenger depots, restaurants and theaters.
3. Residential occupancy is that portion of premises that provides the occupants with complete independent living facilities, including permanent provisions for living, sleeping, eating, cooking and sanitation. Residential occupancies include, among others, dormitories, hotels, multi-unit apartments and private residences.
4. Commercial occupancy is that portion of premises where people transact business, receive personal service or purchase food and other goods. Commercial occupancies include, among others, office and professional buildings, markets (but not large mercantile occupancies) and work or storage areas that do not qualify as industrial occupancies.
5. Large mercantile occupancy is that portion of premises where more than 100 persons congregate on levels above or below street level to purchase personal merchandise.
6. Industrial occupancy is that portion of premises that is not open to the public, where access by authorized persons is controlled, and that is used to manufacture, process or store goods such as chemicals, food, ice, meat or petroleum.
7. Mixed occupancy occurs when two or more occupancies are located within the same building. When each occupancy is isolated from the rest of the building by tight walls, floors and ceilings and by self-closing doors, the requirements for each occupancy shall apply to its portion of the building. When the various occupancies are not so isolated, the occupancy having the most stringent requirements shall be the governing occupancy.

1104.3 Volume calculations. Volume calculations shall be in accordance with Sections 1104.3.1 through 1104.3.3.

1104.3.1 Unventilated spaces. Where the refrigerant-containing parts of a system are located in one or more unventilated spaces, the volume of the smallest, enclosed occupied space, other than a machinery room, shall be used to determine the permissible quantity of refrigerant in the system. Where a building consists of several stories of unpartitioned space, such as a mezzanine or an atrium, the story having the smallest occupied space shall be deemed to be the enclosed space.

1104.3.2 Ventilated spaces. Where an evaporator or condenser is located in an air duct system, the volume of the smallest occupied space or unpartitioned building story, served by the duct shall be used to determine the maximum allowable quantity of refrigerant in the system.

EXCEPTION: If airflow to any enclosed space cannot be reduced below one-quarter of its maximum, the entire space served by the air duct system shall be used to determine the maximum allowable quantity of refrigerant in the system.

1104.3.3 Plenums. Where the space above a suspended ceiling is continuous and part of the supply or return air plenum system, this space shall be included in calculating the volume of the enclosed space.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 519-32-1104, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1105 Machinery room, general requirements.

1105.1 General. Where required by Table 1104.2(1), a machinery room shall be provided to enclose refrigeration systems located indoors. Access to the machinery room shall be restricted to authorized personnel. For rooms where occupational exposure could occur, see WAC 296-62-07515 and 296-62-3112.

1105.2 Dimensions. A machinery room shall be dimensioned so as to provide clearances required by Chapter 3. There shall be clear head room of not less than 7 feet 3 inches (2210 mm) below equipment located over passageways.

1105.3 Doors. Each machinery room shall have self-closing, weather-stripped doors opening in the direction of egress travel. Doors and door openings shall comply with the requirements of the building code.

1105.4 Openings. Openings to other parts of the building that permit passage of escaping refrigerant to other parts of the building are prohibited. Ducts and air handlers in the machinery room that operate at a lower pressure than the room shall be sealed to prevent any refrigerant leakage from entering the airstream.

EXCEPTIONS: 1. Egress doors serving the machinery room.
2. Access doors and panels in air ducts and air-handling units, provided that such openings are gasketed and tight fitting.

TABLE 1104.2(1)
SYSTEM APPLICATION REQUIREMENTS
(Letters in the table under "Occupancy" refer to footnotes.
Where more than one footnote exists, each footnote is a limitation on the other.)
(For system and refrigerant cla ssifications see Section 1103 and Table 1104.1.)

REFRIGERANT GROUP	SYSTEM CLASSIFICATION	OCCUPANCY[d]		
		Institutional	Public assembly, residential, commercial and large mercantile	Industrial
A1	High Low	a d	b d	c d
A2	High Low	c g	c g	c, f, h g
A3	High Low	i i	i i	c, f, h g
B1	High Low	a, f d	b, f d	c d
B2	High Low	e, f g	c, f g	c, f, h g
B3	High Low	i i	i i	c, f, h g

For SI: 1 square foot = 0.0929 m^2, 1 pound = 0.454 kg.

[a] The refrigerant amount is limited to 50 percent of those listed in Table 1104.1, except Footnote b applies in kitchens, laboratories and mortuaries. If any portion of a refrigerant system containing more than 1 pound of refrigerant (except R-744) is in a room with a flame-sustaining device, this device shall be provided with a hood to exhaust combustion products to the outside air. Otherwise Footnotes e and f shall be followed.

[b] The refrigerant amount shall be limited as listed in Table 1104.1.

[c] The refrigerant amount shall be unlimited when all of the following are satisfied:

1. The area containing machinery is separated from the areas of the building not containing machinery by tight construction with tight-fitting doors;
2. Egress from the room is directly outdoors;
3. The number of persons in a machinery-containing space on any floor above the first floor (ground level or deck level) is equal to or less than one person per 100 square feet of floor area or, if the number exceeds one person per 100 square feet, the machinery-containing space shall be provided with the required number of doors opening directly into approved building exits; and
4. Detectors are located in areas where refrigerant vapor from a leak will concentrate so as to provide warning at levels not exceeding the TLV-TWA quantities given in Table 1104.1. Otherwise, the footnotes for other occupancies shall apply.

Exception: For ammonia, see Section 1106.8.

[d] When the quantity of refrigerant in the largest system exceeds the amounts in Table 1104.1, all refrigerant-containing parts, except piping and those parts outside the building, shall be installed in a machinery room meeting the general requirements of Section 1105.

[e] Refrigerant amounts and types of systems shall be limited as shown in Table 1104.2(2).

[f] Applications involving air conditioning for human comfort are prohibited.

[g] When the quantity of refrigerant in the largest system exceeds the amounts in Table 1104.1, all refrigerant-containing parts, except piping and those parts outside the building, shall be installed in a special requirements machinery room in accordance with Section 1106 with limitations on refrigerant quantities as follows:

550 pounds — Institutional

No limit except Footnote h — Public Assembly

No limit except Footnote h — Residential

No limit except Footnote h – All other occupancies

No limit except Footnote h — Industrial

Otherwise, Footnote e applies to the amount of Group A2, A3, B2 or B3 refrigerant in the system.

[h] When the quantity of refrigerant exceeds Table 1104.1 amounts, all refrigerant-containing parts, except piping, low-side components, condensers, and parts outside the building, shall be installed in a machinery room meeting the general requirements in Section 1105. For refrigerants of Groups A2, A3, B2 and B3:

1. The machinery room shall also meet the special requirements of Section 1106.
2. Except for ammonia, amounts in excess of 1,100 pounds shall be approved by the code official.

[i] Use of these refrigerants is prohibited, except in laboratories in commercial occupancies. Only unit systems containing not more than 6.6 pounds of Group A3 or B3 refrigerant shall be used unless the laboratory is occupied by less than one person per 100 square feet of floor area, in which case the requirements of industrial occupancies shall apply.

TABLE 1104.2(2)
MAXIMUM PERMISSIBLE QUANTITIES OF REFRIGERANTS
[For Use With Footnote e of Table 1104.2(1)]

TYPE OF REFRIGERATION SYSTEM	MAXIMUM POUNDS FOR VARIOUS OCCUPANCIES			
	Institutional	Assembly	Residential	All other occupancies
Sealed Absorption System				
In exit access	0	0	3.3	3.3
In adjacent outdoor locations	0	0	22	22
In other than exit access	0	6.6	6.6	22
Unit Systems				
In other than exit access	0	0	6.6	22

For **SI:** 1 pound = 0.454 kg.

1105.5 Refrigerant vapor detector. Machinery rooms shall contain a refrigerant vapor detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant vapor from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values shown in Table 1104.1. Detectors and alarms shall be placed in approved locations. Detection and alarm systems shall be powered and supervised, monitored and annunciated, and installed and maintained as required by Article 6313.2 of the Uniform Fire Code.

EXCEPTION: Detectors are not required for ammonia systems complying with Section 1106.8.

1105.6 Tests. Periodic tests of the detector, alarm and mechanical ventilating system shall be performed in accordance with manufacturer's specifications and as required by the code official.

1105.7 Fuel-burning equipment. Open flames that use combustion air from the machinery room shall not be installed in a machinery room.

EXCEPTIONS:
1. Matches, lighters, halide leak detectors and similar devices.
2. Where the refrigerant is carbon dioxide or water.
3. Fuel-burning equipment shall not be prohibited in the same machinery room with refrigerant-containing equipment where combustion air is ducted from outside the machinery room and sealed in such a manner as to prevent any refrigerant leakage from entering the combustion chamber, or where a refrigerant vapor detector is employed to automatically shut off the combustion process in the event of refrigerant leakage.

1105.8 Sign. A sign shall be posted on the machinery room door prohibiting access of unauthorized personnel.

1105.9 Ventilation. Machinery rooms shall be mechanically ventilated to the outdoors. Mechanical ventilation shall be capable of exhausting the minimum quantity of air both at the normal operating and emergency conditions. Multiple fans or multispeed fans shall be allowed in order to produce the emergency ventilation rate and to obtain a reduced airflow for normal ventilation. Fans providing refrigeration machinery room temperature control or automatic response to refrigerant vapor are allowed to be automatically controlled to provide intermittent ventilation as conditions require.

EXCEPTION: Where a refrigerating system is located outdoors more than 20 feet (6096 mm) from any building opening and is enclosed by a penthouse, lean-to or other open structure, natural or mechanical ventilation shall be provided. Location of the openings shall be based on the relative density of the refrigerant to air. The free-aperture cross section for the ventilation of the machinery room shall be not less than:

$$F = \sqrt{G}$$

For **SI:** $F = 0.138\sqrt{G}$

where:

F = the free opening area in square feet (m^2).

G = the mass of refrigerant in pounds (kg) in the largest system, any part of which is located in the machinery room.

1105.9.1 Discharge location. The discharge of the air shall be to the outdoors in accordance with Chapter 5. Exhaust from mechanical ventilation systems shall be discharged not less than 20 feet (6096 mm) from a property line or openings into buildings.

1105.9.2 Supply air. Provisions shall be made for supply air to replace that being exhausted. Openings for supply air shall be located to avoid intake of exhaust air. Air supply and exhaust ducts to the machinery room shall serve no other area, shall be constructed in accordance with Chapter 5 and shall be covered with corrosion-resistant screen of not less than 1/4-inch (6.4 mm) mesh. The supply air shall be taken from directly outside the building. Intakes shall be fitted with backdraft dampers or similar approved flow control means to prevent reverse flow.

1105.9.3 Quantity—normal ventilation. During occupied conditions the mechanical ventilation system shall exhaust the larger of the following:

1. Not less than 0.5 cfm per square foot (0.0025 $m^3/s \cdot m^2$) of machinery room area or 20 cfm (0.009 m^3/s) per person; or
2. A volume required to maintain a maximum temperature rise of 18°F. (-7.8°C.) based on all of the heat-producing machinery in the room.

1105.9.4 Quantity—emergency conditions. Upon actuation of the refrigerant detector required in Section 1105.5, the mechanical ventilation system shall exhaust air from the machinery room in the following quantity:

$$Q = 100 \times \sqrt{G}$$

For SI: $Q = 0.07 \times \sqrt{G}$

where:

Q = the airflow in cubic feet per minute (m^3/s).

G = the design mass of refrigerant in pounds (kg) in the largest system, any part of which is located in the machinery room.

1105.10 Termination of relief devices. In the equipment room, pressure relief devices, fusible plugs and purge systems shall terminate outside of the structure at a location not less than 15 feet (4572 mm) above the adjoining grade level and not less than 20 feet (6096 mm) from any window, ventilation opening or exit.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-32-1105, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1106 Machinery room, special requirements.

1106.1 General. Where required by Table 1104.2(1), the machinery room shall meet the requirements of this section in addition to the requirements of Section 1105.

1106.2 Elevated temperature. There shall not be an open flame-producing device or continuously operating hot surface over 800°F. (427°C.) permanently installed in the room.

1106.3 Construction requirements. The machinery room shall be separated from other occupied space with smoke-tight, 1-hour fire-resistance-rated construction.

1106.4 Opening protectives. Opening protection between the machinery room and other occupied spaces shall be approved, self-closing, tight-fitting fire doors with a minimum fire-resistance-rating of 3/4 hour.

1106.5 Pipe penetrations. All pipe penetrations of the interior walls, ceiling or floor of machinery rooms shall be sealed vapor tight and protected in accordance with the building code.

1106.6 Exterior openings. Openings in exterior walls of machinery rooms shall not be located under any exit, stairway or exit discharge.

1106.7 Egress. Exits shall comply with Uniform Building Code Section 1020-Special Hazards.

Each machinery room shall be provided with a minimum of one exit door that opens directly to the outside.

EXCEPTION: Self-closing, tight-fitting doors opening into a vestibule leading directly outside.

1106.8 Ammonia room ventilation. Ventilation equipment in ammonia machinery rooms shall be operated continuously.

EXCEPTIONS: 1. Machinery rooms equipped with a refrigerant vapor detector that will automatically start the ventilation system and actuate an alarm at a detection level not to exceed 1,000 ppm; or

2. Machinery rooms conforming to the Class 1, Division 2, hazardous location classification requirements of NFPA 70.

1106.9 Flammable refrigerants. Where refrigerants of Groups A2, A3, B2 and B3 are used, the machinery room shall conform to the Class 1, Division 2, hazardous location classification requirements of NFPA 70.

EXCEPTION: Ammonia machinery rooms.

1106.10 Remote controls. Remote control of the mechanical equipment located in the machinery room shall be provided at an approved location immediately outside the machinery room and adjacent to its principal entrance.

1106.10.1 Refrigeration system. A clearly identified switch of the break-glass-type shall provide off-only control of all electrically energized equipment in the machinery room, other than refrigerant leak detectors and machinery room ventilation.

1106.10.2 Ventilation system. Mechanical ventilation systems shall have switches to control power to each fan. The switches shall be key operated or within a locked glass-covered enclosure at an approved location adjacent to and outside of the principal entrance to the machinery room. Necessary keys shall be located in a single approved location. Switches controlling fans providing intermittent or emergency ventilation shall be of the three-position, automatic/on/off type. Switches shall be labeled identifying both function and specific fan controlled. Two-colored and labeled indicator lamps responding to the differential pressure created by the air flow shall be provided for each switch. One lamp shall indicate flow, the other shall indicate no flow.

1106.10.3 Emergency control box. An emergency control box shall be provided as required by IIAR 2-1992 Section 5.4. Emergency control boxes shall be designed and constructed to the standards of IIAR 2-1992 Appendix A except as modified by Uniform Fire Code Article 6307.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-32-1106, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1107 Refrigerant piping.

1107.1 General. All refrigerant piping shall be installed, tested and placed in operation in accordance with this chapter.

1107.2 Pipe enclosures. Rigid or flexible metal enclosures or pipe ducts shall be provided for soft, annealed copper tubing and used for refrigerant piping erected on the premises and containing other than Group A1 or B1 refrigerants. Enclosures shall not be required for connections between condensing units and the nearest riser box(es), provided such connections do not exceed 6 feet (1829 mm) in length.

1107.3 Condensation. All refrigerating piping and fittings, brine piping and fittings that, during normal operation, will reach a surface temperature below the dew point of the surrounding air, and are located in spaces or areas where condensation will cause a safety hazard to the building occupants, structure, electrical equipment or any other equipment, shall be protected in an approved manner to prevent such damage.

1107.4 Materials for refrigerant pipe and tubing. Piping materials shall be as set forth in Sections 1107.4.1 through 1107.4.5.

1107.4.1 Steel pipe. Carbon steel pipe with a wall thickness not less than Schedule 80 shall be used for Group A2, A3, B2 or B3 refrigerant liquid lines for sizes 1 1/2 inches (38 mm) and smaller. Carbon steel pipe with a wall thickness not less than Schedule 40 shall be used for Group A1 or B1 refrigerant liquid lines 6 inches (152 mm) and smaller, Group A2, A3, B2 or B3 refrigerant liquid lines sizes 2 inches (51 mm) through 6 inches (152 mm), and all refrigerant suction and discharge lines 6 inches (152 mm) and smaller. Type F steel pipe shall not be used for refrigerant lines having an operating temperature less than -20°F. (-29°C.).

1107.4.2 Copper and brass pipe. Standard iron-pipe size, copper and red brass (not less than 80 percent copper) pipe shall conform to ASTM B 42 and ASTM B 43.

1107.4.3 Copper tube. Copper tube used for refrigerant piping erected on the premises shall be seamless copper tube of Type ACR (hard or annealed) complying with ASTM B 280. Where approved, copper tube for refrigerant piping erected on the premises shall be seamless copper tube of Type K, L or M (drawn or annealed) in accordance with ASTM B 88. Annealed temper copper tube shall not be used in sizes larger than a 2-inch (51 mm) nominal size. Mechanical joints shall not be used on annealed temper copper tube in sizes larger than 7/8-inch (22 mm) OD size.

1107.4.4 Copper tube joints. Copper tubing joints used in refrigerating systems containing Group A2, A3, B2 or B3 refrigerants shall be brazed. Soldered joints shall not be used in such refrigerating systems.

1107.4.5 Aluminum tube. Type 3003-0 aluminum tubing with high-pressure fittings shall not be used with methyl chloride and other refrigerants known to attack aluminum.

1107.5 Joints and refrigerant-containing parts in air ducts. Joints and all refrigerant-containing parts of a refrigerating system located in an air duct of an air-conditioning system carrying conditioned air to and from humanly occupied space shall be constructed to withstand, without leakage, a pressure of 150 percent of the higher of the design pressure or pressure relief device setting.

1107.6 Exposure of refrigerant pipe joints. Refrigerant pipe joints erected on the premises shall be exposed for visual inspection prior to being covered or enclosed.

1107.7 Stop valves. All systems containing more than 6.6 pounds (3 kg) of a refrigerant in systems using positive-displacement compressors, shall have stop valves installed as follows:

1. At the inlet of each compressor, compressor unit or condensing unit.
2. At the discharge outlet of each compressor, compressor unit or condensing unit and of each liquid receiver.

EXCEPTIONS:
1. Systems that have a refrigerant pumpout function capable of storing the entire refrigerant charge in a receiver or heat exchanger.
2. Systems that are equipped with provisions for pumpout of the refrigerant using either portable or permanently installed recovery equipment.
3. Self-contained systems.

1107.7.1 Liquid receivers. All systems containing 100 pounds (45 kg) or more of a refrigerant, other than systems utilizing nonpositive displacement compressors, shall have stop valves, in addition to those required by Section 1107.7, on each inlet of each liquid receiver. Stop valves shall not be required on the inlet of a receiver in a condensing unit, nor on the inlet of a receiver which is an integral part of the condenser.

1107.7.2 Copper tubing. Stop valves used with soft annealed copper tubing or hard-drawn copper tubing 7/8-inch (22 mm) OD standard size or smaller shall be securely mounted, independent of tubing fastenings or supports.

1107.7.3 Identification. Stop valves shall be identified where their intended purpose is not obvious. Numbers shall not be used to label the valves, unless a key to the numbers is located near the valves.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-32-1107, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1108 Field test.

1108.1 General. Every refrigerant-containing part of every system that is erected on the premises, except compressors, condensers, vessels, evaporators, safety devices, pressure gauges and control mechanisms that are listed and factory tested, shall be tested and proved tight after complete installation, and before operation. Tests shall include both the high- and low-pressure sides of each system at not less than the lower of the design pressures or the setting of the pressure-relief device(s). The design pressures for testing shall be those listed on the condensing unit, compressor or compressor unit nameplate, as required by ASHRAE 15-1994.

EXCEPTIONS:
1. Gas bulk storage tanks that are not permanently connected to a refrigeration system.
2. Systems erected on the premises with copper tubing not exceeding 5/8-inch (16 mm) OD, with wall thickness as required by ASHRAE 15-1994, shall be tested in accordance with Section 1108.1, or by means of refrigerant charged into the system at the saturated vapor pressure of the refrigerant at 70°F. (21°C.) or higher.
3. Limited-charge systems equipped with a pressure relief device, erected on the premises, shall be tested at a pressure not less than one and one-half times the pressure setting of the relief device. If the equipment has been tested by the manufacturer at one and one-half times the design pressure, the test after erection on the premises shall be conducted at the design pressure.
4. Where a compressor is used as a booster to obtain an intermediate pressure and discharges into the suction side of another compressor, the booster compressor shall be considered a part of the low side, provided that it is protected by a pressure relief device.
5. In field-testing systems using centrifugal or other nonpositive displacement compressors, the entire system shall be considered as the low-side pressure for field test purposes.

1108.2 Test gases. Tests shall be performed with an inert dried gas including, but not limited to, nitrogen or carbon dioxide. Oxygen, air, toxic or combustible gases, and mixtures containing such gases, shall not be used.

1108.3 Test apparatus. The means used to build up the test pressure shall have either a pressure-limiting device or a pressure-reducing device and a gauge on the outlet side.

1108.4 Declaration. A certificate of test shall be provided for all systems containing 55 pounds (25 kg) or more of refrigerant. The certificate shall give the name of the refrigerant and the field test pressure applied to the high side and the low side of the system. The certification of test shall be signed by the installer and shall be made part of the public record.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-32-1108, filed 12/19/96, effective 7/1/97.]

WAC 51-32-1300 Appendix B, Chapter 13—Fuel-gas piping.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-1300, filed 12/21/94, effective 6/30/95.]

WAC 51-32-1312 Section 1312—Material for gas piping.

1312.1 General. Pipe used for the installation, extension, alteration or repair of gas piping shall be standard weight wrought iron or steel (galvanized or black), yellow brass containing not more than 75 percent copper, or internally tinned or equivalently treated copper of iron pipe size. Approved PE pipe may be used in exterior buried piping systems. Corrugated Stainless Steel Tubing (CSST) may be used for gas piping provided that it is part of a system that has been tested and listed to the ANSI/AGA Standard LC-1 and is installed in accordance with the manufacturer's installation instructions.

1312.2 Reused Pipe. Gas pipe shall be new or shall have been used previously for no purpose other than conveying gas; it shall be in good condition, clean and free from internal obstructions. Burred ends shall be reamed to the full bore of the pipe.

1312.3 Fittings. Fittings used in connection with the piping shall be of malleable iron, yellow brass containing not more than 75 percent copper or approved plastic fittings.

1312.4 Valves and Appurtenances. Valves and appurtenances for gas piping shall be of a type designed and approved for use with fuel gas.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-1312, filed 12/21/94, effective 6/30/95.]

WAC 51-32-1313 Section 1313—Installation of gas piping.

1313.1 Joints. Joints in the piping system, unless welded, shall be threaded joints having approved standard threads. Threaded joints shall be made with approved pipe joint material, insoluble in fuel gas and applied to the male threads only. Welded joints in a gas-supply system shall be made by a pipeline welder. See Section 1302.

1313.2 Location. Gas piping shall not be installed in or on the ground under any building or structure and exposed gas piping shall be kept at least 6 inches (152 mm) above grade or structure. The term "building or structure" shall include structures such as porches and steps, whether covered or uncovered, breezeways, roofed porte-cocheres, roofed patios, carports, covered walks, covered driveways, and similar structures or appurtenances.

Concealed unprotected gas piping may be installed above grade in approved recesses or channels.

EXCEPTION: When necessary due to structural conditions, approved-type gas piping may be installed in other locations when permission has first been obtained from the building official.

1313.3 Drip Pipes. When water vapor is present in the fuel gas served, accessible-drip pipes shall be provided at points where condensation will collect.

1313.4 Corrosion and Covering Protection. Ferrous gas piping installed underground in exterior locations shall be protected from corrosion by approved coatings or wrapping materials applied in an approved manner. Horizontal metallic piping shall have at least 12 inches (305 mm) of earth cover or equivalent protection. Plastic gas piping shall have at least 18 inches (457 mm) of earth cover or equivalent protection. Risers, including prefabricated risers inserted with plastic pipe, shall be metallic and shall be protected in an approved manner to a point at least 6 inches above grade. When a riser connects to plastic pipe underground the horizontal metallic portion underground shall be at least 30 inches (762 mm) in length before connecting to the plastic service pipe. An approved transition fitting or adaptor shall be used where the plastic joins the metallic riser.

EXCEPTION: Listed one-piece 90-degree transition fittings or risers may have less than 30 inches (762 mm) of horizontal metallic piping.

1313.5 Wrapping. Gas pipe protective coatings shall be approved types, machine applied, conforming to recognized standards. Field wrapping shall provide equivalent protection and is restricted to those fittings, short sections, and where the factory wrap has been damaged or necessarily stripped for threading or welding. Zinc coatings (galvanizing) shall not be deemed adequate protection for gas piping below ground. Ferrous metals exposed in exterior locations shall be protected from corrosion in a manner satisfactory to the building official.

1313.6 Support and Fill. Gas piping shall be adequately supported by metal straps or hooks at intervals not to exceed those shown in Table B13-A. Gas piping installed below grade shall be effectively supported at all points on undisturbed or well-compacted soil or sand.

1313.7 Building Shutoff. Gas piping supplying more than one building on a premises shall be equipped with separate shutoff valves to each building, so arranged that the gas supply can be turned on or off to an individual or separate building. The shutoff valve shall be located outside the building it supplies and shall be readily accessible. Buildings accessory to single-family residences are exempt from the requirements of this section.

1313.8 Unions. Where unions are necessary, right and left nipples and couplings shall be used. Ground-joint unions may be used at exposed fixture, appliance or equipment connections and in exposed exterior locations immediately on the discharge side of a building shutoff valve. Heavy-duty flanged-type unions may be used in special cases, when approved by the building official. Bushings shall not be in concealed locations.

1313.9 Interjections. When air, oxygen or other special supplementary gas under pressure is introduced with the regularly supplied gas, either directly into the gas-piping system or at burners, a device approved by the building officials shall be installed to prevent backflow of the supplemental gas into the gas-piping system. The device shall be located between the source of the supplemental gas and meter and shall be on the gas line leading to the appliance using the special gas. This device may be either a spring-loaded or diaphragm-type check valve and shall be capable of withstanding the pressure imposed on it.

When liquefied petroleum or other standby gas is interconnected with the regular gas-piping system, an approved three-way two-port valve or other adequate safeguard acceptable to the building official shall be installed to prevent backflow into either supply system.

1313.10 Valves. Valves used in connection with gas piping shall be approved types, and shall be accessible.

1313.11 Barbecue or Fireplace Outlets. Gas outlets in a barbecue or fireplace shall be controlled by an approved operating valve located in the same room and outside the fireplace but not more than 4 feet (1219 mm) from the outlets. If piping on the discharge side of the control valve is standard weight brass or galvanized steel, the piping may be embedded in or surrounded by not less than 2 inches (51 mm) of concrete or masonry.

1313.12 Shutoff Valve. An accessible shutoff valve of a type set forth in Section 1313.10 shall be installed in the fuel-supply piping outside of each appliance and ahead of the union connection thereto, and in addition to any valve on the appliance. Shutoff valves shall be within 3 feet (914 mm) of the appliance.

Shutoff valves may be located immediately adjacent to and inside or under an appliance when placed in an accessible and protected location and when such appliance may be removed without removal of the valve.

Shutoff valves may be accessibly located inside wall heaters and wall furnaces listed for recessed installation where necessary maintenance can be performed without removal of the shutoff valve.

1313.13 Tracer for Nonmetallic Buried Piping. An electrically continuous insulated No. 18 [0.040 inch diameter (1 mm)] copper tracer wire or other approved conductor shall be installed with and attached to underground nonmetallic gas piping and shall terminate above grade at each end.

1313.14 Directional Changes. Changes in direction of gas piping shall be made by use of appropriate fitting, except that polyethylene gas piping and tubing may be bent to a radius not less than 20 times the nominal diameter of the pipe or tube.

1313.15 Corrosion Isolation. Underground ferrous gas piping shall be electrically isolated from the rest of the gas system with approved isolation fittings installed a minimum of 6 inches (153 mm) above grade.

[Statutory Authority: Chapter 19.27 RCW. 95-01-123, § 51-32-1313, filed 12/21/94, effective 6/30/95.]

Chapter 51-34 WAC

STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1994 EDITION OF THE UNIFORM FIRE CODE

(Formerly chapter 51-24 WAC)

WAC

WAC 51-34-001 Authority. These rules are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-001, filed 12/21/94, effective 6/30/95.]

WAC 51-34-002 Purpose. The purpose of these rules is to implement the provisions of chapter 19.27 RCW, which provides that the state building code council shall maintain the State Building Code in a status which is consistent with the purpose as set forth in RCW 19.27.020. In maintaining the codes the council shall regularly review updated versions of the codes adopted under the act, and other pertinent information, and shall amend the codes as deemed appropriate by the council.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-002, filed 12/21/94, effective 6/30/95.]

WAC 51-34-003 Uniform Fire Code. The 1994 edition of the Uniform Fire Code, including Appendix II-F, Protected Aboveground Tanks For Motor Vehicle Fuel-Dispensing Stations Outside Buildings, published by the International Fire Code Institute is hereby adopted by reference with the following additions, deletions, and exceptions.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-003, filed 12/21/94, effective 6/30/95.]

WAC 51-34-007 Exceptions. The exceptions and amendments to the Uniform Fire Code contained in the provisions of chapter 19.27 RCW shall apply in case of conflict with any of the provisions of these rules.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-007, filed 12/21/94, effective 6/30/95.]

WAC 51-34-008 Implementation. The Uniform Fire Code adopted by chapter 51-34 WAC shall become effective in all counties and cities of this state on June 30, 1995.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-008, filed 12/21/94, effective 6/30/95.]

WAC 51-34-0200 Article 2—Definitions and abbreviations.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-0200, filed 12/21/94, effective 6/30/95.]

WAC 51-34-0206 Section 206—E.

EARLY SUPPRESSION FAST-RESPONSE (ESFR) SPRINKLER is a sprinkler listed for early suppression fast-response performance.

ELECTRIC BLASTING CAP is a shell containing a charge of detonating compound designed to be fired by an electric current.

ELECTRICAL CODE is the National Electrical Code promulgated by the National Fire Protection Association, as adopted in WAC 296-46, or the locally adopted Electrical Code.

ELECTRICAL FIRING UNIT is the source of electrical current used to ignite electric matches. Generally, the firing unit will have switches to control the routing of the current to various firework items and will have a test circuit and warning indicators.

ELECTROSTATIC FLUIDIZED BED is a container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material which is electrically charged with a charge opposite to the charge of the object to be coated. Such object is transported through the container immediately above the charged and aerated materials in order to be coated.

ENCAPSULATED is a method of packaging consisting of a plastic sheet completely enclosing the sides and top of a pallet load. The term encapsulated does not apply to banding or individual plastic-enclosed items inside a large nonplastic-enclosed container.

EXCESS FLOW CONTROL is a fail-safe system designed to shut off flow due to a rupture in pressurized piping systems.

EXCESS FLOW VALVE is a valve inserted into a compressed gas cylinder, portable tank or stationary tank that is designed to positively shut off the flow of gas in the event that its predetermined flow is exceeded.

EXECUTIVE BODY is the governing body of the jurisdiction adopting this code.

EXHAUSTED ENCLOSURE is a noncombustible enclosure which consists of a top, a back and two sides. The enclosure provides a means of local exhaust, but lacks the isolated environment provided by gas cabinets or gas rooms. Such enclosures include laboratory hoods, exhaust fume hoods and similar appliances and equipment used to locally retain and exhaust the gases, fumes, vapors and mists that could be released. Rooms or areas provided with general ventilation, in themselves, do not constitute exhausted enclosures. See the definition of GAS ROOM.

EXIT is a continuous and unobstructed means of egress to a public way and shall include intervening aisles, doors, doorways, gates, corridors, exterior exit balconies, ramps, stairways, pressurized enclosures, horizontal exits, exit passageways, exit courts and yards.

EXIT COURT is a yard or court providing access to a public way for one or more required exits.

EXIT PASSAGEWAY is an enclosed exit connecting a required exit or exit court with a public way.

EXPANDED PLASTIC is a foamed or cellular plastic material having a reduced density based on the presence of numerous small cavities or cells dispersed throughout the material.

EXPLOSION is an effect produced by the sudden violent expansion of gases, which may be accompanied by a shock wave or disruption, or both, of enclosing materials or structures. An explosion could result from

1. Chemical changes such as rapid oxidation, deflagration or detonation, decomposition of molecules and runaway polymerization (usually detonations);

2. Physical changes such as pressure tank ruptures; or

3. Atomic changes (nuclear fission or fusion).

EXPLOSIVE is

1. A chemical that causes a sudden, almost instantaneous release of pressure, gas and heat when subjected to sudden shock, pressure, or high temperatures, or

2. A material or chemical, other than a blasting agent, that is commonly used or intended to be used for the purpose of producing an explosive effect and is regulated by Article 77.

EXPLOSIVE MATERIALS are explosives, blasting agents and detonators including, but not limited to, dynamite and other high explosives; slurries, emulsions and water gels; black powder and pellet powder; initiating explosives; detonators or blasting caps; safety fuses; squibs; detonating cord; igniter cord; igniters and Class B (Explosives, Division 1.3 and some Division 1.2-see Appendix VI-E) special fireworks.

EXTENSION CORD is a portable flexible cord of any length which has one male connector on one end and one or more female connectors on the other, and no built-in overcurrent protection.

EXTRAHIGH-RACK COMBUSTIBLE STORAGE is storage on racks of Class I, II, III or IV commodities which exceed 40 feet (121 920 mm) in height and storage on racks of high-hazard commodities which exceed 30 feet (9144 mm) in height.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-0206, filed 12/21/94, effective 6/30/95.]

WAC 51-34-0216 Section 216—O.

OCCUPANCY is the purpose for which a building or part thereof is used or intended to be used.

OCCUPANCY CLASSIFICATION. For the purpose of this code, certain occupancies are defined as follows:

Group A Occupancies:

Group A Occupancies include the use of a building or structure, or a portion thereof, for the gathering together of 50 or more persons for purposes such as civic, social or religious functions; recreation, education or instruction; food or drink consumption; or awaiting transportation. A room or space used for assembly purposes by less than 50 persons and accessory to another occupancy shall be included as a part of that major occupancy. Assembly occupancies shall include the following:

Division 1. A building or portion of a building having an assembly room with an occupant load of 1,000 or more and a legitimate stage.

Division 2. A building or portion of a building having an assembly room with an occupant load of less than 1,000 and a legitimate stage.

Division 2.1. A building or portion of a building having an assembly room with an occupant load of 300 or more without a legitimate stage, including such buildings used for educational purposes and not classed as Group B or E Occupancies.

Division 3. A building or portion of a building having an assembly room with an occupant load of less than 300 without a legitimate stage, including such buildings used for educational purposes and not classed as Group B or E Occupancies.

Division 4. Stadiums, reviewing stands and amusement park structures not included within other Group A Occupancies.

Group B Occupancies:

Group B Occupancies shall include buildings, structures, or portions thereof, for office, professional or service-type transactions, which are not classified as Group H Occupancies. Such occupancies include occupancies for the storage of records and accounts, and eating and drinking establishments with an occupant load of less than 50. Business occupancies shall include, but not be limited to, the following:

1. Animal hospitals, kennels, pounds.

2. Automobile and other motor vehicle showrooms.

3. Banks.

4. Barber shops.

5. Beauty shops.

6. Car washes.

7. Civic administration.

8. Outpatient clinic and medical offices (where five or less patients in a tenant space are incapable of unassisted self-preservation).

9. Dry cleaning pick-up and delivery stations and self-service.

10 Educational occupancies above the 12th grade.

11. Electronic data processing.

12. Fire stations.

13. Florists and nurseries.

14. Laboratories—testing and research.

15. Laundry pick-up and delivery stations and self-service.

16. Police stations.

17. Post offices.

18. Print shops.

19. Professional services such as attorney, dentist, physician, engineer.

20. Radio and television stations.

21. Telephone exchanges.

Group E Occupancies:

Group E Occupancies shall be:

Division 1. Any building used for educational purposes through the 12th grade by 50 or more persons for more than 12 hours per week or four hours in any one day.

Division 2. Any building used for educational purposes through the 12th grade by less than 50 persons for more than 12 hours per week or four hours in any one day.

Division 3. Any building or portion thereof used for day-care purposes for more than six persons.

EXCEPTION: Family child day care homes as defined in WAC 51-30, Uniform Building Code, shall be considered Group R, Division 3 Occupancies.

Group F Occupancies:

Group F Occupancies shall include the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as Group H Occupancies. Factory and industrial occupancies shall include the following:

Division 1. Moderate-hazard factory and industrial occupancies shall include factory and industrial uses which are not classified as Group F, Division 2 Occupancies, but are not limited to facilities producing the following:

1. Aircraft.
2. Appliances.
3. Athletic equipment.
4. Automobiles and other motor vehicles.
5. Bakeries.
6. Alcoholic beverages.
7. Bicycles.
8. Boats.
9. Brooms and brushes.
10. Business machines.
11. Canvas or similar fabric.
12. Cameras and photo equipment.
13. Carpets and rugs, including cleaning.
14. Clothing.
15. Construction and agricultural machinery.
16. Dry cleaning and dyeing.
17. Electronics assembly.
18. Engines, including rebuilding.
19. Photographic film.
20. Food processing.
21. Furniture.
22. Hemp products.
23. Jute products.
24. Laundries.
25. Leather products.
26. Machinery.
27. Metal.
28. Motion pictures and television filming and videotaping.
29. Musical instruments.
30. Optical goods.
31. Paper mills or products.
32. Plastic products.
33. Printing or publishing.
34. Recreational vehicles.
35. Refuse incineration.
36. Shoes.
37. Soaps and detergents.
38. Tobacco.
39. Trailers.
40. Wood, distillation.
41. Millwork (sash and door).
42. Woodworking, cabinet.

Division 2. Low-hazard factory and industrial occupancies shall include facilities producing noncombustible or nonexplosive materials which, during finishing, packing or processing, do not involve a significant fire hazard, including, but not limited to, the following:

1. Nonalcoholic beverages.
2. Brick and masonry.
3. Ceramic products.
4. Foundries.
5. Glass products.
6. Gypsum.
7. Ice.
8. Steel products—fabrication and assembly.

Group H Occupancies:

Group H Occupancies shall include buildings or structures, or portions thereof, that involve the manufacturing, processing, generation or storage of materials that constitute a high fire, explosion or health hazard. Group H Occupancies shall be:

Division 1. Occupancies with a quantity of material in the building in excess of those listed in Table 8001.13-A, which present a high explosion hazard, including, but not limited to:

1. Explosives, blasting agents, fireworks and black powder.

EXCEPTION: Storage and the use of pyrotechnic special effect materials in motion picture, television, theatrical and group entertainment production when under permit as required by Section 7801.3.2. The time period for storage shall not exceed 90 days.

2. Unclassified detonatable organic peroxides.

3. Class 4 oxidizers.

4. Class 4 or Class 3 detonatable unstable (reactive) materials.

Division 2. Occupancies where combustible dust is manufactured, used or generated in such a manner that concentrations and conditions create a fire or explosion potential; occupancies with a quantity of material in the building in excess of those listed in Table 8001.13-A, which present a moderate explosion hazard or a hazard from accelerated burning, including, but not limited to:

1. Class I organic peroxides.

2. Class 3 nondetonatable unstable (reactive) materials.

3. Pyrophoric gases.

4. Flammable or oxidizing gases.

5. Class I, II or III-A flammable or combustible liquids which are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15-pounds-per-square-inch (103.4 kPa) gage.

EXCEPTION: Aerosols.

6. Class 3 oxidizers.

7. Class 3 water-reactive materials.

Division 3. Occupancies where flammable solids, other than combustible dust, are manufactured, used or generated.

Division 3 Occupancies also include uses in which the quantity of material in the building in excess of those listed in Table 8001.13-A, presents a high physical hazard, including, but not limited to:

1. Class II, III or IV organic peroxides.

2. Class 1 or 2 oxidizers.

3. Class I, II or III-A flammable or combustible liquids which are used or stored in normally closed containers or systems and containers or systems pressurized at 15-pounds-per-square-inch (103.4 kPa) gage or less, and aerosols.

4. Class III-B combustible liquids.

5. Pyrophoric liquids or solids.

6. Class 1 or 2 water-reactive materials.

7. Flammable solids in storage.

8. Flammable or oxidizing cryogenic fluids (other than inert).

9. Class 1 unstable (reactive) gas or Class 2 unstable (reactive) materials.

Division 4. Repair garages not classified as Group S, Division 3 Occupancies.

Division 5. Aircraft repair hangars not classified as Group S, Division 5 Occupancies and heliports.

Division 6. Semiconductor fabrication facilities and comparable research and development areas in which hazardous production materials (HPM) are used and the aggregate quantity of materials are in excess of those listed in Table 8001.13-A or 8001.13-B.

Division 7. Occupancies having quantities of materials in excess of those listed in Table 8001.13-B that are health hazards, including:

1. Corrosives.

2. Toxic and highly toxic materials.

3. Irritants.

4. Sensitizers.

5. Other health hazards.

Group I Occupancies:

Group I Occupancies shall be:

Division 1.1. Nurseries for the full-time care of children under the age of six (each accommodating more than five children).

Hospitals, sanitariums, nursing homes with nonambulatory patients and similar buildings (each accommodating more than five patients).

Division 1.2. Health-care centers for ambulatory patients receiving outpatient medical care which may render the patient incapable of unassisted self-preservation (each tenant space accommodating more than five such patients).

Division 2. Nursing homes for ambulatory patients, homes for children six years of age or over (each accommodating more than five patients or children).

Division 3. Mental hospitals, mental sanitariums, jails, prisons, reformatories and buildings where personal liberties of inmates are similarly restrained.

EXCEPTION: Group I Occupancies shall not include buildings used only for private residential purposes for a family group.

Group LC Occupancies:

Group LC Occupancies shall be:

Group LC Occupancies shall include buildings, structures, or portions thereof, used for the business of providing licensed care to clients in one of the following categories regulated by either the Washington Department of Health or the Department of Social and Health Services:

1. Adult family home.

2. Adult residential rehabilitation facility.

3. Alcoholism intensive inpatient treatment service.

4. Alcoholism detoxification service.

5. Alcoholism long term treatment service.

6. Alcoholism recovery house service.

7. Boarding home.

8. Group care facility.

9. Group care facility for severely and multiple handicapped children.

10. Residential treatment facility for psychiatrically impaired children and youth.

EXCEPTION: Where the care provided at an alcoholism detoxification service is acute care similar to that provided in a hospital, the facility shall be classified as a Group I, Division 1.1 hospital.

Group M Occupancies:

Group M Occupancies shall include buildings, structures, or portions thereof, used for the display and sale of merchandise, and involving stocks of goods, wares or merchandise incidental to such purposes and accessible to the public. Mercantile occupancies shall include, but are not limited to, the following:

1. Department stores.
2. Drug stores.
3. Markets.
4. Paint stores without bulk handling.
5. Shopping centers.
6. Sales rooms.
7. Wholesale and retail stores.

Group R Occupancies:

Group R Occupancies shall be:

Division 1. Hotels and apartment houses. Congregate residences (each accommodating more than 10 persons).

Division 2. Not used.

Division 3. Dwellings, family child day care homes as defined in WAC 51-30, Uniform Building Code, and lodging houses. Congregate residences (each accommodating 10 persons or less).

Group S Occupancies:

Group S Occupancies shall include the use of a building or structure, or a portion thereof, for storage not classified as a hazardous occupancy. Storage occupancies shall include the following:

Division 1. Moderate hazard storage occupancies shall include buildings or portions of buildings used for storage of combustible materials that are not classified as a Group S, Division 2 or as a Group H Occupancy.

Division 2. Low-hazard storage occupancies shall include buildings, structures, or portions thereof, used for storage of noncombustible materials, such as products on wood pallets or in paper cartons with or without single-thickness divisions, or in paper wrappings and shall include ice plants, power plants and pumping plants. Such products may have a negligible amount of plastic trim such as knobs, handles or film wrapping. Low-hazard storage occupancies shall include, but are not limited to, storage of the following items:

1. Beer or wine (in metal, glass or ceramic containers).
2. Cement in bags.
3. Cold storage and creameries.
4. Dairy products in nonwax-coated paper containers.
5. Dry-cell batteries.
6. Dryers.
7. Dry pesticides in a building not classified as a Group H Occupancy.
8. Electrical coils.
9. Electrical insulators.
10. Electrical motors.
11. Empty cans.
12. Foods in noncombustible containers.
13. Fresh fruits in nonplastic trays or containers.
14. Frozen foods.
15. Glass bottles (empty or filled with nonflammable liquids).
16. Gypsum board.
17. Inert pigments.
18. Meats.
19. Metal cabinets.
20. Metal furniture.
21. Oil-filled distribution transformers.
22. Stoves.
23. Washers.

Division 3. Division 3 Occupancies shall include repair garages where work is limited to exchange of parts and maintenance requiring no open flame or welding, motor vehicle fuel-dispensing stations, and parking garages not classified as Group S, Division 4 open parking garages or Group U private garages.

Division 4. Open parking garages as set forth in the Building Code. (See U.B.C. Section 311.)

Division 5. Aircraft hangars where work is limited to exchange of parts and maintenance requiring no open flame or welding and helistops.

Group U Occupancies:

Group U Occupancies shall include buildings or structures, or portions thereof, and shall be:

Division 1. Private garages, carports, sheds and agricultural buildings.

EXCEPTION: Where applicable in accordance with the Building Code (see U.B.C. Section 101.3 for agricultural buildings. See also U.B.C. Appendix Chapter 3).

Division 2. Fences over 6 feet (1829 mm) high, tanks and towers.

OIL-BURNING EQUIPMENT is an oil burner of any type together with its tank, piping, wiring, controls and related devices. Oil-burning equipment includes oil burners, oil-fired units and heating and cooking appliances but does not include equipment exempted by Section 6101.

OIL-FIRED UNIT is a heating appliance equipped with one or more oil burners and the necessary safety

controls, electrical equipment and related equipment manufactured for assembly as a complete unit. Oil-fired unit does not include kerosene stoves or oil stoves.

OPEN BURNING is the burning of a bonfire, rubbish fire or other fire in an outdoor location where fuel being burned is not contained in an incinerator, outdoor fireplace, barbecue grill or barbecue pit. See WAC Chapter 173-425.

OPEN-AIR GRANDSTANDS and BLEACHERS are seating facilities which are located so that the side toward which the audience faces is unroofed and without an enclosing wall. See also Section 203 for BLEACHERS.

OPERATING LINE is a group of separated operating buildings of specific arrangement used in the assembly, modification, reconditioning, renovation, maintenance, inspection, surveillance, testing or manufacturing of explosives.

ORGANIC COATING is a liquid mixture of binders, such as alkyd, nitrocellulose, acrylic or oil and flammable and combustible solvents such as hydrocarbon, ester, ketone or alcohol, which when spread in a thin film converts to a durable protective and decorative finish.

ORGANIC PEROXIDE is an organic compound that contains the bivalent -0-0- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms have been replaced by an organic radical. Organic peroxides can present an explosion hazard (detonation or deflagration) or they can be shock sensitive. They can also decompose into various unstable compounds over an extended period of time.

OSHA is the Occupational Safety and Health Administration.

OTHER HEALTH HAZARD MATERIAL is a hazardous material which affects target organs of the body, including, but not limited to, those materials which produce liver damage, kidney damage, damage to the nervous system, act on the blood to decrease hemoglobin function, deprive the body tissue of oxygen, or affect reproductive capabilities, including mutations (chromosomal damage) or teratogens (effects on fetuses).

OWNER includes persons having vested or contingent interest in the property in question and their duly authorized agents or attorneys, purchasers, devisees and fiduciaries.

OXIDIZER is a chemical other than a blasting agent or explosive that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-0216, filed 12/21/94, effective 6/30/95.]

WAC 51-34-0219 Section 219—R.

RACK STORAGE is a combination of vertical, horizontal and diagonal members that support stored materials. Racks are allowed to be fixed or portable. See Article 81.

RADIATION SOURCE MATERIALS, COMMON, are radioisotopes, other than fissile materials, commonly used in various medical and industrial testing and measuring situations.

RADIOACTIVE MATERIAL is a material or combination of materials that spontaneously emits ionizing radiation.

RAILWAY is a steam, electric or other railroad which carries passengers for hire.

REACTIVE MATERIAL is a material which can enter into a hazardous chemical reaction with other stable or unstable materials.

READY BOX is a storage container for aerial shells at the site of a fireworks display.

RECEPTACLE is an electrical outlet designed for use with a plug or connector for the purpose of supplying electrical power to an appliance.

RECREATIONAL FIRE is the burning of materials other than rubbish where fuel being burned is not contained in an incinerator, outdoor fireplace, barbecue grill or barbecue pit and with a total fuel area of 3 feet (914 mm) or less in diameter and 2 feet (610 mm) or less in height for pleasure, religious, ceremonial, cooking or similar purposes. See WAC Chapter 173-425.

REDUCED FLOW VALVE is a valve equipped with a restricted flow orifice and inserted into a compressed gas cylinder, portable tank or stationary tank that is designed to reduce the maximum flow from the valve under full flow conditions. The maximum flow rate from the valve is determined with the valve allowed to flow to atmosphere with no other piping or fittings attached.

REFINERY is a plant in which flammable or combustible liquids are produced on a commercial scale from crude petroleum, natural gasoline or other hydrocarbon sources.

REFRIGERANT is the fluid used for heat transfer in a refrigerating system; the refrigerant absorbs heat and transfers it at a higher temperature and a higher pressure, usually with a change of state.

REMOTE PUMPING SYSTEM. See PRESSURE DELIVERY SYSTEM.

REMOTE SOLVENT RESERVOIR is a liquid solvent container which is completely enclosed against evaporative losses to the atmosphere during nonuse periods, except for a solvent return opening not larger than 16 square inches (10 323 mm^2). Such return allows pump-cycled used solvent to drain back into the reservoir from a separate solvent sink or work area.

The reservoir is allowed to be integral to the parts-cleaning machine it services or separate and connected by hoses, tubing, piping or similar devices.

REPAIR is the reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

RETAIL DISPLAY AREA is the area of a Group M Occupancy open for the purpose of viewing or purchasing merchandise offered for sale. Individuals in such establishments are free to circulate among the items offered for sale which are typically displayed on shelves, racks or the floor.

RETAIL SALES OCCUPANCY is the occupancy or use of a building or structure or any portion thereof for displaying, selling or buying of goods, wares or merchandise.

REVIEWING STANDS are elevated platforms accommodating not more than 50 persons. Seating facilities, if provided, are normally in the nature of loose chairs. Reviewing stands accommodating more than 50 persons shall be regulated as grandstands.

ROOM. See LIQUID STORAGE ROOM and see Section 7903.2.3 for construction requirements for rooms where flammable or combustible liquids are used, dispensed or mixed in quantities exceeding exempt amounts.

RUBBISH is waste material including, but not limited to, garbage, waste paper and debris from construction or demolition.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-0219, filed 12/21/94, effective 6/30/95.]

WAC 51-34-0223 Section 223—V.

VAPOR AREA is an area containing flammable vapors. The chief is authorized to determine the extent of the vapor area, taking into consideration the characteristics of the liquid, the degree of sustained ventilation and the nature of operations.

VAPOR BALANCE SYSTEM is a system designed to capture and retain, without processing, vapors displaced during the filling of tanks and containers or during the fueling of vehicles.

VAPOR PRESSURE is the pressure exerted by a volatile fluid as determined by U.F.C. Standard 2-5.

VAPOR-PROCESSING SYSTEM is a system designed to capture and process vapors displaced during filling operations at motor vehicle fuel-dispensing stations, bulk plants or terminals by use of mechanical or chemical means. Examples include systems using blower-assist for capturing vapors and refrigeration absorption and combustion systems for processing vapors.

VAPOR-PROCESSING UNIT is the actual vapor-processing equipment in one contiguous unit in an isolated or separated area. Vapor-processing units do not include in-line flame arresters, in-line fire checks, pressure vacuum valves, in-line check valves or flow regulators at the dispenser.

VAPOR-RECOVERY SYSTEM is a system designed to capture and retain, without processing, vapors displaced during filling operations at motor vehicle fuel-dispensing stations, bulk plants or terminals. Examples include balanced-pressure vapor displacement systems and vacuum-assist systems without vapor processing.

VAPOR-TRANSFER EQUIPMENT is the components of a vapor-processing system, a vapor balance system, or other approved system which is designed to capture, transfer and prevent emissions of vapors or liquids displaced during filling of tanks or containers or during the fueling of vehicles. Examples include the vapor/liquid-dispensing nozzle, vapor-transfer lines and tank vents.

VEHICLE FUELING APPLIANCE is a listed natural gas compressor package, not containing storage, designed for the unattended dispensing of natural gas into the fuel tanks of motor vehicles.

VENT-RELEASE CONTAINER is an aerosol container which is designed to provide a controlled venting of the base product and propellant at a nominal hydrostatic pressure of less than 210 psig (1447 kPa).

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-0223, filed 12/21/94, effective 6/30/95.]

WAC 51-34-0900 Article 9—Fire department access and water supply.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-0900, filed 12/21/94, effective 6/30/95.]

WAC 51-34-0901 Section 901—General.

901.1 Scope. Fire department access and water supply shall be in accordance with Article 9.

For fire safety during construction, alteration or demolition of a building, see Article 87.

901.2 Permits and Plans.

901.2.1 Permits. A permit is required to use or operate fire hydrants or valves intended for fire-suppression purposes which are installed on water systems and accessible to public highways, alleys or private ways open to or generally used by the public. See Section 105, Permit f.1.

EXCEPTION: A permit is not required for persons employed and authorized by the water company which supplies the system to use or operate fire hydrants or valves.

901.2.2 Plans.

901.2.2.1 Fire hydrant systems. Plans and specifications for fire hydrant systems shall be submitted to the fire department for review and approval prior to construction.

901.3 Timing of Installation. When fire protection, including fire apparatus access roads and water supplies for fire protection, is required to be installed, such protection shall be installed and made serviceable prior to and during the time of construction.

EXCEPTION: When alternate methods of protection, as approved by the chief, are provided, the requirements of Section 901.3 may be modified or waived.

901.4 Required Marking of Fire Apparatus Access Roads, Addresses and Fire Protection Equipment.

901.4.1 General. Marking of fire apparatus access roads, addresses and fire protection equipment shall be in accordance with Section 901.4.

901.4.2 Reserved.

901.4.3 Fire protection equipment and fire hydrants. Fire-protection equipment and fire hydrants shall be clearly identified in a manner approved by the chief to prevent obstruction by parking and other obstructions.

When required by the chief, hydrant locations shall be identified by the installation of reflective markers.

See also Section 1001.7.

901.4.4 Premises identification. Approved numbers or addresses shall be placed on all new and existing buildings in such a position as to be plainly visible and legible from the street or road fronting the property. Numbers shall contrast with their background.

901.4.5 Street or Road Signs. When required by the chief, streets and roads shall be identified with approved signs.

901.5 Obstruction and Control of Fire Apparatus Access Roads and Fire Protection Equipment. See Sections 902.2.4 and 1001.7.

901.6 Fire Protection in Recreational Vehicle, Mobile Home and Manufactured Housing Parks, Sales Lots and Storage Lots. Recreational vehicle, mobile home and manufactured housing parks, sales lots and storage lots shall provide and maintain fire hydrants and access roads in accordance with Sections 902 and 903.

EXCEPTION: Recreational vehicle parks located in remote areas shall be provided with protection and access roadways as required by the chief.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-0901, filed 12/21/94, effective 6/30/95.]

WAC 51-34-0902 Section 902—Fire department access.

902.1 General. Fire apparatus access roads shall be provided and maintained in accordance with locally adopted street, road, and access standards.

902.2.4 Obstruction and control of fire apparatus access.

902.2.4.1 General. Entrances to roads, trails or other accessways which have been closed with gates and barriers in accordance with Section 902.2.4.2 shall not be obstructed by parked vehicles.

902.2.4.2 Closure of accessways. The chief is authorized to require the installation and maintenance of gates or other approved barricades across roads, trails or other accessways, not including public streets, alleys or highways.

When required, gates and barricades shall be secured in an approved manner. Roads, trails and other accessways which have been closed and obstructed in the manner prescribed by Section 902.2.4.2 shall not be trespassed upon or used unless authorized by the owner and the chief.

EXCEPTION: Public officers acting within their scope of duty.

Locks, gates, doors, barricades, chains, enclosures, signs, tags or seals which have been installed by the fire department or by its order or under its control shall not be removed, unlocked, destroyed, tampered with or otherwise molested in any manner.

EXCEPTION: When authorized by the chief or performed by public officers acting within their scope of duty.

902.3 Access to Building Openings.

902.3.1 Required access. Exterior doors and openings required by this code or the Building Code shall be maintained readily accessible for emergency access by the fire department.

An approved access walkway leading from fire apparatus access roads to exterior openings required by this code or the Building Code shall be provided when required by the chief.

902.3.2 Maintenance of exterior doors and openings. Exterior doors or their function shall not be eliminated without prior approval by the chief. Exterior doors which have been rendered nonfunctional and which retain a functional door exterior appearance shall have a sign affixed to the exterior side of such door stating THIS DOOR BLOCKED. The sign shall consist of letters having principal stroke of not less than ¾ inch (19.1 mm) wide and at least 6 inches (152.4 mm) high on a contrasting background. Required fire department access doors shall not be obstructed or eliminated. See Section 1207 for exit doors.

For access doors for high-piled combustible storage, see Section 8102.5.2.

902.3.3 Shaftway marking. Exterior windows in buildings used for manufacturing or for storage purposes which open directly on shaftways or other vertical means of communication between two or more floors shall be plainly marked with the word SHAFTWAY in red letters at least 6 inches (152.4 mm) high on a white background. Warning signs shall be easily discernible from the outside of the building. Door and window openings on such shaftways from the interior of the building shall be similarly marked with the word SHAFTWAY in a manner which is easily visible to anyone approaching the shaftway from the interior of the building, unless the construction of the partition surrounding the shaftway is of such distinctive nature as to make its purpose evident at a glance.

902.4 Key boxes. When access to or within a structure or an area is unduly difficult because of secured openings or where immediate access is necessary for life-saving or firefighting purposes, the chief is authorized to require a key box to be installed in an accessible location. The key box shall be of a type approved by the chief and shall contain keys to gain necessary access as required by the chief.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-0902, filed 12/21/94, effective 6/30/95.]

WAC 51-34-1000 Article 10—Fire-protection systems and equipment.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-1000, filed 12/21/94, effective 6/30/95.]

WAC 51-34-1003 Section 1003—Fire-extinguishing systems.

1003.1 Installation Requirements.

1003.1.1 General. Fire-extinguishing systems shall be installed in accordance with the Building Code and Section 1003.

Fire hose threads used in connection with fire-extinguishing systems shall be national standard hose thread or as approved by the chief.

The location of fire department hose connections shall be approved by the chief.

In buildings used for high-piled combustible storage, fire protection shall be in accordance with Article 81.

1003.1.2 Standards. Fire-extinguishing systems shall comply with the Building Code. (See U.B.C. Standard 9-1.)

EXCEPTIONS:
1. Automatic fire-extinguishing systems not covered by the Building Code shall be approved and installed in accordance with approved standards.
2. Automatic sprinkler systems may be connected to the domestic water-supply main when approved by the building official, provided the domestic water supply is of adequate pressure, capacity and sizing for the combined domestic and sprinkler requirements. In such case, the sprinkler system connection shall be made between the public water main or meter and the building shutoff valve, and there shall not be intervening valves or connections. The fire department connection may be omitted when approved by the chief.
3. Automatic sprinkler systems in Group R Occupancies four stories or less may be in accordance with the Building Code requirements for residential sprinkler systems. (See U.B.C. Standard 9-3.)

1003.1.3 Modifications. When residential sprinkler systems as set forth in the Building Code (see U.B.C. Standard 9-3) are provided, exceptions to, or reductions in, Building Code requirements based on the installation of an automatic fire-extinguishing system are not allowed.

1003.2 Required Installations.

1003.2.1 General. An automatic fire-extinguishing system shall be installed in the occupancies and locations as set forth in Section 1003.2.

For provisions on special hazards and hazardous materials, see Section 1001.9 and Articles 79, 80 and 81.

1003.2.2 All occupancies except Group R, Division 3 and Group U Occupancies. Except for Group R, Division 3 and Group U Occupancies, an automatic sprinkler system shall be installed:

1. In every story or basement of all buildings when the floor area exceeds 1,500 square feet (139.4 m²) and there is not provided at least 20 square feet (1.86 m²) of opening entirely above the adjoining ground level in each 50 lineal feet (15 240 mm) or fraction thereof or exterior wall in the story or basement on at least one side of the building. Openings shall have a minimum dimension of not less than 30 inches (762 mm). Such openings shall be accessible to the fire department from the exterior and shall not be obstructed in a manner that firefighting or rescue cannot be accomplished from the exterior.

When openings in a story are provided on only one side and the opposite wall of such story is more than 75 feet (22 860 mm) from such openings, the story shall be provided with an approved automatic sprinkler system, or openings as specified above shall be provided on at least two sides of an exterior wall of the story.

If any portion of a basement is located more than 75 feet (22 860 mm) from openings required in Section 1003.2.2, the basement shall be provided with an approved automatic sprinkler system.

2. At the top of rubbish and linen chutes and in their terminal rooms. Chutes extending through three or more floors shall have additional sprinkler heads installed within such chutes at alternate floors. Sprinkler heads shall be accessible for servicing.

3. In rooms where nitrate film is stored or handled. See also Article 33.

4. In protected combustible fiber storage vaults as defined in Article 2. See also Article 28.

5. Throughout all buildings with a floor level with an occupant load of 30 or more that is located 55 feet (16 764 mm) or more above the lowest level of fire department vehicle access.

EXCEPTIONS:
1. Airport control towers.
2. Open parking structures.
3. Group F, Division 2 Occupancies.

1003.2.3 Group A Occupancies.

1003.2.3.1 Drinking establishments. An automatic sprinkler system shall be installed in rooms used by the occupants for the consumption of alcoholic beverages and unseparated accessory uses where the total area of such unseparated rooms and assembly uses exceeds 5,000 square feet (465 m²). For uses to be considered as separated, the separation shall not be less than as required for a one-hour occupancy separation. The area of other uses shall be included unless separated by at least a one-hour occupancy separation.

1003.2.3.2 Basements. An automatic sprinkler system shall be installed in basements classified as a Group A Occupancy when the basement is larger than 1,500 square feet (139 m²) in floor area.

1003.2.3.3 Exhibition and display rooms. An automatic sprinkler system shall be installed in Group A Occupancies which have more than 12,000 square feet (112 m²) of floor area which can be used for exhibition or display purposes.

1003.2.3.4 Stairs. An automatic sprinkler system shall be installed in enclosed usable space below or over a stairway in Group A, Divisions 2, 2.1, 3 and 4 Occupancies.

1003.2.3.5 Multitheater complexes. An automatic sprinkler system shall be installed in every building containing a multitheater complex.

1003.2.3.6 Amusement buildings. An automatic sprinkler system shall be installed in all amusement buildings. The main water-flow switch shall be electrically supervised. The sprinkler main cutoff valve shall be supervised. When the amusement building is temporary, the sprinkler water-supply system may be of an approved temporary type.

EXCEPTION: An automatic sprinkler system need not be provided when the floor area of a temporary amusement building is less than 1,000 square feet (92.9 m²) and the exit travel distance from any point is less than 50 feet (15 240 mm).

1003.2.3.7 Stages. All stages shall be sprinklered. Such sprinklers shall be provided throughout the stage and in dressing rooms, workshops, storerooms and other accessory spaces contiguous to such stages.

EXCEPTIONS:
1. Sprinklers are not required for stages 1,000 square feet (92.9 m²) or less in area and 50 feet (1542 mm) or less in height where curtains, scenery or other combustible hangings are not retractable vertically. Combustible hangings shall be limited to a single main curtain, borders, legs and a single backdrop.
2. Under stage areas less than 4 feet (1219 mm) in clear height used exclusively for chair or table storage and lined

on the inside with 5/8-inch (16 mm) Type X gypsum wallboard or an approved equal.

1003.2.4 Group E Occupancies.

1003.2.4.1 General. An automatic fire-extinguishing system shall be installed in all newly constructed buildings classified as Group E, Division 1 Occupancy. A minimum water supply meeting the requirements of UBC Standard 9-1 shall be required. The Chief may reduce fire flow requirements for buildings protected by an approved automatic sprinkler system.

For the purpose of this section, additions exceeding 60 percent of the value of such building or structure, or alterations and repairs to any portion of a building or structure within a twelve month period that exceeds 100 percent of the value of such building or structure shall be considered new construction. In the case of additions, area separation walls shall define separate buildings.

EXCEPTION: Portable school classrooms, provided:
1. Aggregate area of clusters of portable school classrooms does not exceed 5,000 square feet (465 m²); and
2. Clusters of portable school classrooms separated as required in Chapter 5 of the Building Code.

When not required by other provisions of this chapter, a fire-extinguishing system installed in accordance with UBC Standard 9-1 may be used for increases allowed in Chapter 5 of the Building Code.

1003.2.4.2 Basements. An automatic sprinkler system shall be installed in basements classified as Group E, Division 1 Occupancies.

1003.2.4.3 Stairs. An automatic fire sprinkler system shall be installed in enclosed usable space below or over a stairway in Group E, Division 1 Occupancies.

1003.2.5 Group H Occupancies.

1003.2.5.1 General. An automatic fire-extinguishing system shall be installed in Group H, Divisions 1, 2, 3 and 7 Occupancies.

1003.2.5.2 Group H, Division 4 Occupancies. An automatic fire-extinguishing system shall be installed in Group H, Division 4 Occupancies having a floor area of more than 3,000 square feet (279 m²).

1003.2.5.3 Group H, Division 6 Occupancies. An automatic fire-extinguishing system shall be installed throughout buildings containing Group H, Division 6 Occupancies. The design of the sprinkler system shall not be less than that required under the Building Code (see U.B.C. Standard 9-1) for the occupancy hazard classifications as follows:

LOCATION	OCCUPANCY HAZARD CLASSIFICATION
Fabrication areas	Ordinary Hazard Group 2
Service corridors	Ordinary Hazard Group 2
Storage rooms without dispensing	Ordinary Hazard Group 2
Storage rooms with dispensing	Extra Hazard Group 2
Exit corridors	Ordinary Hazard Group 2[1]

[1]When the design area of the sprinkler system consists of a corridor protected by one row of sprinklers, the maximum number of sprinklers that needs to be calculated is 13.

1003.2.6 Group I Occupancies. An automatic sprinkler system shall be installed in Group I Occupancies. Listed quick response sprinklers shall be installed in light hazard areas in accordance with their listing.

EXCEPTION: In jails, prisons and reformatories, the piping system may be dry, provided a manually operated valve is installed at a continuously monitored location. Opening of the valve will cause the piping system to be charged. Sprinkler heads in such systems shall be equipped with fusible elements or the system shall be designed as required for deluge systems in the Building Code (see U.B.C. Standard 9-1).

1003.2.7 Group M Occupancies. An automatic sprinkler system shall be installed in retail sales rooms classified as Group M Occupancies where the floor area exceeds 12,000 square feet (1114.8 m²) on any floor or 24,000 square feet (2229.7 m²) on all floors or in Group M retail sales occupancies more than three stories in height. The area of mezzanines shall be included in determining the areas where sprinklers are required.

1003.2.8 Group R, Division 1 Occupancies. An automatic sprinkler system shall be installed throughout every apartment house three or more stories in height or containing 16 or more dwelling units, every congregate residence three or more stories in height or having an occupant load of 20 or more, and every hotel three or more stories in height or containing 20 or more guest rooms. Residential or quick-response standard sprinklers shall be used in the dwelling units and guest room portions of the building.

1003.3 Sprinkler System Monitoring and Alarms.

1003.3.1 Where required. All valves controlling the water supply for automatic sprinkler systems and water-flow switches on all sprinkler systems shall be electrically monitored where the number of sprinklers are:

1. Twenty or more in Group I, Divisions 1.1 and 1.2 Occupancies.

2. One hundred or more in all other occupancies.

Valve monitoring and water-flow alarm and trouble signals shall be distinctly different and shall be automatically transmitted to an approved central station, remote station or proprietary monitoring station as defined by U.F.C. Standard 10-2 or, when approved by the building official with the

concurrence of the chief, shall sound an audible signal at a constantly attended location.

EXCEPTION: Underground key or hub valves in roadway boxes provided by the municipality or public utility need not be monitored.

1003.3.2 Alarms. An approved audible sprinkler flow alarm shall be provided on the exterior of the building in an approved location. An approved audible sprinkler flow alarm to alert the occupants shall be provided in the interior of the building in a normally occupied location. Actuation of the alarm shall be as set forth in the Building Code. (See U.B.C. Standard 9-1.)

1003.4 Permissible Sprinkler Omissions. Subject to the approval of the building official and with the concurrence of the chief, sprinklers may be omitted in rooms or areas as follows:

1. When sprinklers are considered undesirable because of the nature of the contents or in rooms or areas which are of noncombustible construction with wholly noncombustible contents and which are not exposed by other areas. Sprinklers shall not be omitted from any room merely because it is damp, of fire-resistive construction or contains electrical equipment.

2. Sprinklers shall not be installed when the application of water or flame and water to the contents may constitute a serious life or fire hazard, as in the manufacture or storage of quantities of aluminum powder, calcium carbide, calcium phosphide, metallic sodium and potassium, quicklime, magnesium powder and sodium peroxide.

3. Safe deposit or other vaults of fire-resistive construction, when used for the storage of records, files and other documents, when stored in metal cabinets.

4. Communication equipment areas under the exclusive control of a public communication utility agency, provided:

4.1 The equipment areas are separated from the remainder of the building by one-hour fire-resistive occupancy separation; and

4.2 Such areas are used exclusively for such equipment; and

4.3 An approved automatic smoke-detection system is installed in such areas and is supervised by an approved central, proprietary or remote station service or a local alarm which will give an audible signal at a constantly attended location; and

4.4 Other approved fire-protection equipment such as portable fire extinguishers or Class II standpipes are installed in such areas.

5. Other approved automatic fire-extinguishing systems may be installed to protect special hazards or occupancies in lieu of automatic sprinklers.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-1003, filed 12/21/94, effective 6/30/95.]

WAC 51-34-1007 Section 1007—Fire alarm systems.

1007.1 General.

1007.1.1 Applicability. Installation and maintenance of fire alarm systems shall be in accordance with Section 1007.

1007.1.2 Testing. See Section 1001.4.

1007.1.3 Maintenance. See Section 1001.5.1.

1007.1.4 Problematic systems and systems out of service. In the event of temporary failure of the alarm system or an excessive number of accidental alarm activations, the chief is authorized to require the building owner or occupant to provide standby personnel as set forth in Section 2501.19 until the system is restored.

1007.1.5 Where new construction or modification is to be in compliance with adopted WAC 51-30, Chapter 11, alarm modifications shall be designed to be compatible with the requirements of Article 10, U.F.C.

1007.2 Required Installations.

1007.2.1 General.

1007.2.1.1 When required. An approved manual, automatic or manual and automatic fire alarm system shall be provided in accordance with Section 1007.2.

1007.2.1.2 Use of area separation walls to define separate buildings. For the purposes of Section 1007, area separation walls shall not define separate buildings.

1007.2.2 Group A Occupancies.

1007.2.2.1 General. Group A, Divisions 1, 2 and 2.1 Occupancies shall be provided with a manual fire alarm system in accordance with Section 1007.2.2.

EXCEPTIONS: 1. Manual fire alarm boxes are not required when an approved automatic fire-extinguishing system is installed which will immediately activate the prerecorded announcement upon water flow.
2. Group A Occupancy portions of Group E Occupancies are allowed to have alarms as required for the Group E Occupancy.

See also Section 1007.2.12.

1007.2.2.2 System initiation. Activation of the fire alarm shall immediately initiate an approved prerecorded message announcement using an approved electrically supervised voice communication or public address system which is audible above the ambient noise level of the occupancy.

EXCEPTION: When approved by the chief, the prerecorded announcement is allowed to be manually deactivated for a period of time not to exceed 3 minutes for the sole purpose of allowing a live voice announcement from an approved, constantly attended station.

1007.2.2.3 Emergency power. Voice communication and public address systems shall be provided with an approved emergency power source.

1007.2.3 Group B Occupancies. See Section 1007.2.12.

1007.2.4 Group E Occupancies.

1007.2.4.1 General. Group E Occupancies shall be provided with fire alarm systems in accordance with Section 1007.2.4. Group E, Division 1 Occupancies and Group E, Division 3 Occupancies having an occupant load of 50 or more shall be provided with an approved manual fire alarm system. When automatic sprinkler systems or smoke detectors provided in accordance with Section 1007.2.4.2 are

installed, such systems or detectors shall be connected to the building fire alarm system, and the building fire alarm system shall be both automatic and manual. See also Section 1007.2.12.

1007.2.4.2 Smoke detectors.

1007.2.4.2.1 Increased travel distance. Smoke detectors shall be installed when required by the Building Code for increased in travel distance to exits. (See U.B.C. Section 1017.3.)

1007.2.4.2.2 Exits through adjoining rooms. Smoke detectors shall be installed when required by the Building Code to allow the only means of egress from a room to be through adjoining or intervening rooms. (See U.B.C. Section 1017.4.)

1007.2.4.3 Exterior alarm-signaling device. A alarm-signaling device shall be mounted on the exterior of the building.

1007.2.5 Group F Occupancies. See Section 1007.2.12.

1007.2.6 Group H Occupancies.

1007.2.6.1 General. Group H Occupancies shall be provided with fire alarm systems in accordance with Section 1007.2.6. See also Section 1007.2.12.

1007.2.6.2 Organic coatings. Organic coating manufacturing uses shall be provided with a manual fire alarm system. See Article 50.

1007.2.6.3 Group H, Division 6 Occupancies. Group H, Division 6 Occupancies shall be provided with a manual fire alarm system. See Article 51.

1007.2.6.4 Rooms used for storage, dispensing, use and handling of hazardous materials. When required by Article 80, rooms or areas used for storage, dispensing, use or handling of highly toxic compressed gases, liquid and solid oxidizers, and Class I, II, III or IV organic peroxides shall be provided with an automatic smoke-detection system.

1007.2.7 Group I Occupancies.

1007.2.7.1 Divisions 1.1, 1.2 and 2 Occupancies.

1007.2.7.1.1 System requirements. Group I, Divisions 1.1, 1.2 and 2 Occupancies shall be provided with an approved manual and automatic fire alarm system in accordance with Section 1007.2.7.1. See also Section 1007.2.12. Smoke detectors shall be provided in accordance with the Building Code as follows:

1. At automatic-closing doors in smoke barriers and one-hour fire-resistive occupancy separations (see U.B.C. Sections 308.2.2.1 and 308.8),

2. In waiting areas which are open to corridors (see U.B.C. Section 1019.3).

When actuated, alarm-initiating devices shall activate an alarm signal which is audible throughout the building.

EXCEPTION: Visual alarm-signaling devices are allowed to substitute for audible devices in patient use areas.

1007.2.7.1.2 Patient room smoke detectors. Smoke detectors which receive their primary power from the building wiring shall be installed in patient sleeping rooms of hospital and nursing homes. Actuation of such detectors shall cause a visual display on the corridor side of the room in which the detector is located and shall cause an audible and visual alarm at the respective nurses' station. When single-station detectors and related devices are combined with a nursing call system, the nursing call system shall be listed for the intended combined use.

EXCEPTION: In rooms equipped with automatic door closers having integral smoke detectors on the room side, the integral detector may substitute for the room smoke detector, provided it performs the required alerting functions.

1007.2.7.2 Division 3 Occupancies.

1007.2.7.2.1 General. Group I, Division 3 Occupancies shall be provided with a manual and automatic fire alarm system installed for alerting staff in accordance with Section 1007.2.7.2. See also Section 1007.2.12.

1007.2.7.2.2 System initiation. Actuation of an automatic fire-extinguishing system, a manual fire alarm box or a fire detector shall initiate an approved fire alarm signal which automatically notifies staff. Presignal systems shall not be used.

1007.2.7.2.3 Manual fire alarm boxes.

1. General. Manual fire alarm boxes need not be located in accordance with Section 1007.3.3.1 when they are provided at staff-attended locations having direct supervision over areas where manual fire alarm boxes have been omitted.

2. Locking of manual fire alarm boxes. Manual fire alarm boxes are allowed to be locked in areas occupied by detainees, provided that staff members are present within the subject area and have keys readily available to operate the manual fire alarm boxes.

1007.2.7.2.4 Smoke detection. An approved automatic smoke-detection system shall be installed throughout resident housing areas, including sleeping areas and contiguous day rooms, group activity spaces and other common spaces normally accessible to residents.

EXCEPTION: Other approved smoke-detection arrangements providing equivalent protection, such as placing detectors in exhaust ducts from cells or behind protective grilles, are allowed when necessary to prevent damage or tampering.

1007.2.7.2.5 Zoning and annunciation. Alarm and trouble signals shall be annunciated at an approved constantly attended location. Such signals shall indicate the zone of origin.

Separate zones shall be provided for individual fire-protection systems, buildings, floors, cell complexes and sections of floors compartmented by smoke-stop partitions.

1007.2.7.2.6 Monitoring. The fire alarm system shall be monitored by an approved central, proprietary or remote station service or by transmission of a local alarm which will give audible and visual signals at an approved constantly attended location.

1007.2.8 Group M Occupancies. See Section 1007.2.12.

1007.2.9 Group R, Division 1 Occupancies.

1007.2.9.1 System requirements.

1007.2.9.1.1 General. Group R Occupancies shall be provided with fire alarm systems in accordance with Section 1007.2.9. Group R, Division 1 Occupancies shall be provided with a manual and automatic fire alarm system in apartment houses three or more stories in height or containing 16 or more dwelling units, in hotels three or more stories in height or containing 20 or more guest rooms, and in congregate residences three or more stories in height or having an occupant load of 20 or more. See also Section 1007.2.12.

EXCEPTIONS: 1. A manual fire alarm system need not be provided in buildings not over two stories in height when all individual dwelling units and contiguous attic and crawl spaces are separated from each other and public or common areas by at least one-hour fire-resistive occupancy separations and each individual dwelling unit or guest room has an exit directly to a public way, exit court or yard.
2. A separate fire alarm system need not be provided in buildings which are protected throughout by an approved supervised fire sprinkler system conforming with the Building Code and having a local alarm to notify all occupants.

1007.2.9.1.2 Manual fire alarm boxes. Manual fire alarm boxes are not required for interior corridors having smoke detectors as specified in Section 1007.2.9.1.3.

1007.2.9.1.3 Smoke detectors. Smoke detectors shall be provided in all common areas and interior corridors serving as a required exit for an occupant load of 10 or more.

1007.2.9.1.4 Heat detectors. Heat detectors shall be provided in common areas such as recreational rooms, laundry rooms, furnace rooms, and similar areas in accordance with U.F.C. Standard 10-3.

1007.2.9.1.5 Visual signaling devices. Guest rooms for persons with hearing impairments shall be provided with visible and audible alarm-indicating appliances, activated by both the in-room smoke detector and the building fire alarm system.

1007.2.9.2 Single-station smoke detectors. Approved single-station smoke detectors shall be installed in dwelling units, congregate residences and hotel or lodging house guest rooms in accordance with the Building Code.

Single-station smoke detectors shall not be connected to a fire alarm system. See also Section 1007.2.9.1.5.

EXCEPTION: Connection of such detectors for annunciation only.

1007.2.10 Group S Occupancies. See Section 1007.2.12.

1007.2.11 Group U Occupancies. No requirements.

1007.2.12 Special uses and conditions.

1007.2.12.1 Amusement buildings.

1007.2.12.1.1 General. An approved smoke-detection system shall be provided in amusement buildings in accordance with Section 1007.2.12.1.

EXCEPTION: In areas where ambient conditions will cause a smoke-detection system to alarm, an approved alternate type of automatic detector shall be installed.

1007.2.12.1.2 Alarm system. Activation of any single smoke detector, the automatic sprinkler system or other automatic fire-detection device shall immediately sound an alarm in the building at a constantly supervised location from which the manual operation of systems noted in Section 1007.2.12.1.3 can be initiated.

1007.2.12.1.3 System response. The activation of two or more smoke detectors, a single smoke detector monitored by an alarm verification zone, the automatic sprinkler system or other approved fire-detection device shall automatically:

1. Stop confusing sounds and other visual effects,

2. Activate approved directional exit marking, and

3. Cause illumination of the exit path with light of not less than one footcandle at the walking surface.

1007.2.12.1.4 Public address system. The public address system is also allowed to serve as an alarm.

1007.2.12.2 High-rise buildings.

1007.2.12.2.1 General. Group B office buildings and Group R, Division 1 Occupancies, each having floors used for human occupancy located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, shall be provided with an automatic fire alarm system and a communication system in accordance with Section 1007.2.12.2.

1007.2.12.2.2 Automatic fire alarm system. Smoke detectors shall be provided in accordance with Section 1007.2.12.2.2. Smoke detectors shall be connected to an automatic fire alarm system. The actuation of any detector required by Section 1007.2.12.2.2 shall operate the emergency voice alarm-signaling system and shall place into operation all equipment necessary to prevent the recirculation of smoke. Smoke detectors shall be located as follows:

1. In every mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar room, and in elevator lobbies. Elevator lobby detectors shall be connected to an alarm verification zone or be listed as a releasing device;

2. In the main return-air and exhaust-air plenum of each air-conditioning system. Such detectors shall be located in a serviceable area downstream of the last duct inlet;

3. At each connection to a vertical duct or riser serving two or more stories from a return-air duct or plenum of an air-conditioning system. In Group R, Division 1 Occupancies, an approved smoke detector is allowed to be used in each return-air riser carrying not more than 5,000 cubic feet per minute (2360 L/s) and serving not more than 10 air-inlet openings; and

4. For Group R, Division 1 Occupancies, in all interior corridors serving as a required exit for an occupant load of 10 or more.

1007.2.12.2.3 Emergency voice alarm-signaling system. The operation of any automatic fire detector, sprinkler or water-flow device shall automatically sound an alert tone followed by voice instructions giving appropriate information and directions on a general or selective basis to the following terminal areas:

1. Elevators,

2. Elevator lobbies,

3. Corridors,

4. Exit stairways,

5. Rooms and tenant spaces exceeding 1,000 square feet (93 m²) in area,

6. Dwelling units in apartment houses, and

7. Hotel guest rooms or suites.

A manual override for emergency voice communication shall be provided for all paging zones.

The emergency voice alarm-signaling system shall be designed and installed in accordance with the Building Code and U.F.C. Standard 10-2.

1007.2.12.2.4 Fire department communication system. A two-way, approved fire department communication system shall be provided for fire department use. It shall operate between the central control station and elevators, elevator lobbies, emergency and standby power rooms and at entries into enclosed stairways.

1007.2.12.3 Buildings with atriums. Actuation of an atrium smoke-control system required by the Building Code shall initiate an audible fire alarm signal in designated portions of the building.

1007.2.12.4 High-piled combustible storage uses. When required by Article 81, high-piled combustible storage uses shall be provided with an automatic smoke-detection system throughout.

1007.2.12.5 Special egress-control devices. When special egress-control devices are installed on exit doors, an automatic smoke-detection system shall be installed throughout the building. (See U.B.C. Section 1004.5.)

1007.2.12.6 Corridors in office uses. When required by the Building Code for corridors in lieu of one-hour corridor construction, smoke detectors shall be installed within office corridors in accordance with their listing. The actuation of any detector shall activate alarms audible in all areas served by the corridor. (See U.B.C. Section 1005.7, Exception 5.)

1007.2.12.7 Aerosol storage uses. When required by Article 88, aerosol storage rooms and general purpose warehouses containing aerosols shall be provided with an approved manual alarm system.

1007.2.12.8 Smoke-control systems. An approved automatic smoke-detection system shall be provided when required by the Building Code for automatic control of a smoke-control system. (See U.B.C. Section 905.9.)

1007.2.12.9 Accessible buildings.

1007.2.12.9.1 General. Alarm systems in buildings which are required to have accessible building facilities shall include both audible and visible alarms. All devices shall be listed or approved. The alarm devices shall be located in all accessible sleeping accommodations and common use areas, including toilet rooms and bathing facilities, hallways, and lobbies.

EXCEPTIONS: 1. Alarm systems in Group I, Division 1.1 and 1.2 Occupancies may be modified to suit standard health care design practice.

2. Visible alarms are not required in Group R, Division 1 apartment buildings.

1007.2.12.9.2 Alarms.

1007.2.12.9.2.1 Audible alarms. Audible alarms shall produce a sound in accordance with UFC Standard 10-1. Audible alarms shall exceed the prevailing equivalent sound level in the room or space by at least 15 decibels, or shall exceed any maximum sound level with a duration of 30 seconds by decibels, whichever is louder. Sound levels for alarm signals shall not exceed 120 decibels.

1007.2.12.9.2.2 Visible alarms. Visible alarm signal appliances shall be integrated into the building or facility alarm system. All devices shall be listed or approved. Where single-station audible alarms are provided, single-station visible alarm signals shall be provided.

EXCEPTION: Visible alarms are not required in Group R, Division 1 apartment buildings.

Visible alarms shall be located per nationally recognized standards. NFPA 72, 1993 edition, and ANSI 117.1, 1992, shall be considered equivalent facilitation.

1007.2.12.9.2.3 Access to manual fire alarm systems. Manual fire alarm devices shall be mounted at least 36 inches (914.4 mm) and not more than 54 inches (1371.6 mm) above the floor where a parallel approach is provided. Where a parallel approach can not be provided the height shall not exceed 48 inches (1219.2 mm).

1007.3 General System Design and Installation Requirements.

1007.3.1 Design standards. Fire alarm systems, automatic fire detectors, emergency voice alarm communication systems and notification devices shall be designed, installed and maintained in accordance with U.F.C. Standards 10-2 and 10-3 and other nationally recognized standards.

1007.3.2 Equipment. Systems and components shall be listed and approved for the purpose for which they are installed.

1007.3.3 System layout and operation.

1007.3.3.1 Manual fire alarm boxes. When a manual fire alarm system is required, manual fire alarm boxes shall be distributed throughout so that they are readily accessible, unobstructed, and are located in the normal path of exit travel from the area and as follows:

1. At every exit from every level.

2. Additional fire alarm boxes shall be located so that travel distance to the nearest box does not exceed 200 feet (60 960 mm).

1007.3.3.2 Control units, annunciator panels and access keys. The alarm control unit, remote annunciator panel and access keys to locked fire alarm equipment shall be installed and maintained in a location approved by the chief.

1007.3.3.3 Alarm initiation and signal.

1007.3.3.3.1 General. When actuated, fire alarm-initiating devices shall activate an alarm signal which is audible throughout the building or in designated portions of the building when approved by the chief.

EXCEPTION: Single-station detectors in dwelling units, rooms used for sleeping purposes in hotel and lodging houses, and patient sleeping rooms in hospitals and nursing homes.

1007.3.3.3.2 Alarm signal. The alarm signal shall be keyed to one half to one second "on" and one second "off" for three cycles, immediately after which, when a voice alarm is required by Section 1007.2, a voice announcement shall be broadcast. The alarm signal shall be repeated for the duration that the fire alarm system is activated.

EXCEPTIONS: This alarm signal is not required for:
1. Group A Occupancies having a fire alarm signal in accordance with Section 1007.2.2.
2. Patient and inmate areas of Group I Occupancies.

1007.3.3.3.3 Audibility. The alarm signal shall be a distinctive sound which is not used for any other purpose other than the fire alarm. Alarm-signaling devices shall produce a sound that exceeds the prevailing equivalent sound level in the room or space by 15 decibels minimum, or exceeds any maximum sound level with a duration of 30 seconds minimum by 5 decibels minimum, whichever is louder. Sound levels for alarm signals shall be 120 decibels maximum.

1007.3.3.3.4 Visual alarms. Alarm systems shall include both audible and visual alarms. Alarm devices shall be located in hotel guest rooms as required by the Building Code (see U.B.C. Section 1105.4.6); accessible public- and common-use areas, including toilet rooms and bathing facilities; hallways; and lobbies. (See Council of American Building Officials/American National Standards Institute Standard A117.1-1992, Section 4-26.2, for additional information about visual signals.)

1007.3.3.4 Connections to other systems. A fire alarm system shall not be used for any purpose other than fire warning unless approved by the chief.

1007.3.3.5 Supervision. Means of interconnecting equipment, devices and appliances shall be supervised for the integrity of the interconnecting conductors or equivalent, as set forth in U.F.C. Standard 10-2.

1007.3.3.6 Monitoring.

1007.3.3.6.1 General. When required by the chief, fire alarm systems shall be monitored by an approved central, proprietary or remote station service or a local alarm which gives audible and visual signals at a constantly attended location.

1007.3.3.6.2 Automatic telephone dialing devices. Automatic telephone dialing devices used to transmit an emergency alarm shall not be connected to any fire department telephone number unless approved by the chief.

1007.3.3.7 Annunciation. Fire alarm systems shall be divided into alarm zones when required by the chief. When two or more alarm zones are required, visible annunciation shall be provided in a location approved by the chief.

1007.3.4 Acceptance test and certification.

1007.3.4.1 Acceptance test. Upon completion of the installation, a satisfactory test of the entire system shall be made in the presence of the chief. All functions of the system or alteration shall be tested.

1007.3.4.2 Certification. The permittee shall provide written certification to the chief that the system has been installed in accordance with the approved plans and specifications.

1007.3.4.3 Instructions. When required by the chief, operating, testing and maintenance instructions and "as-built" drawings and equipment specifications shall be provided at an approved location.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-1007, filed 12/21/94, effective 6/30/95.]

WAC 51-34-2500 Article 25—Places of assembly.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-2500, filed 12/21/94, effective 6/30/95.]

WAC 51-34-2501 Section 2501—General.

2501.1 Scope. Places of assembly shall be in accordance with Article 25.

2501.2 Definitions. For definitions of ASSEMBLY; BLEACHERS; DISPERSAL AREA, SAFE; FOLDING AND TELESCOPING SEATING; FOOTBOARDS; GRANDSTANDS; OPEN-AIR GRANDSTANDS AND BLEACHERS; PERMANENT STANDS; REVIEWING STANDS; SMOKE-PROTECTED ASSEMBLY SEATING and TEMPORARY SEATING FACILITIES, see Article 2.

2501.3 Permits and Plans. For permits to operate a place of assembly, operate a carnival or fair, use liquid- or gas-fueled vehicles or equipment for competition or display inside an assembly occupancy, or use candles or other open-flame devices in assembly areas, see Section 105, Permits cl., c.2, 1.2 and p.2.

Plans of carnival and fair grounds shall be submitted when required by the chief.

2501.4 Supervision and Communication System.

2501.4.1 Supervision. Places of assembly shall be under the constant supervision of a competent adult on the premises during the time that the premises are open to the public.

2501.4.2 Communication. When required by the chief, places of assembly shall be provided with a method for notifying the fire department in the event of an emergency. Such method can consist of a telephone, an alarm system connected to the fire department or other approved agency, or other approved means. Methods of notifying the fire department shall be readily available to the public.

2501.5 Decorative Materials. Combustible decorative materials shall be in accordance with Section 1103.3.3.

2501.6 Pyroxylin-coated Fabrics. Pyroxylin-coated fabrics used as a decorative material in accordance with Section 2501.6 or a surface covering on fixed furnishing, shall be limited in amount to the following:

1. Fabrics containing 1.4 ounces to 1.7 ounces of cellulose nitrate per square yard (47.59 g/m^2 to 57.6 g/m^2) shall not be used in excess of a total amount equivalent to 1 square foot of fabric surface to 15 cubic feet of room volume (0.22 m^2/m^3).

2. Fabrics containing 1.7 ounces or more of cellulose nitrate per square yard (57.6 g/m²) shall not be used in excess of a total amount equivalent to 0.5 square feet of fabric surface to 15 cubic feet of room volume (0.11 m²/m³).

3. Measurement can be accomplished by folding a piece to five thicknesses and measuring to see if the thickness of five layers exceeds 1/8 inch (3.2 mm).

2501.7 Motion Picture Screens. In places of assembly, motion picture screens or screen masking shall be in accordance with Section 2501.5.

2501.8 Exit Doors.

2501.8.1 General. Exit doors shall comply with Sections 1207 and 2501.8.

2501.8.2 Panic hardware. Exit doors from Group A Occupancies having an occupant load of 50 or more shall not be provided with a latch or lock unless it is panic hardware.

EXCEPTIONS: 1. In Group A, Division 3 Occupancies and in all churches, panic hardware may be omitted from the main exit when the main exit consists of a single door or pair of doors. A key-locking device may be used in place of the panic hardware, provided there is a readily visible durable sign adjacent to the doorway stating THIS DOOR MUST REMAIN UNLOCKED DURING BUSINESS HOURS. The sign shall be in letters not less than 1 inch (25.4 mm) high on a contrasting background. When unlocked, the single door or both leaves of a pair of doors must be free to swing without operation of any latching device. When a pair of doors is installed, one leaf shall have no locking devices whatsoever, and the second leaf shall be arranged to latch or lock into the frame and into the first leaf in such a manner that a single unlocking action will unlock both leaves simultaneously. Flush, edge or surface bolts or any other type of device that may be used to close or restrain the door other than by operation of the locking device is prohibited. The use of this exception may be revoked by the building official for due cause.

2. Panic hardware may be waived on gates surrounding stadiums when the gates are under constant immediate supervision while the public is present and provided safe dispersal areas based on 3 square feet metric (0.28m²) per occupant are located between the stadium and the fence. Gates may be horizontal sliding or swinging and may exceed the 4-foot-width (1219 mm) limitation. The required dispersal area shall be located not less than 50 feet (15 240 mm) from the stadium.

2501.9 Aisles.

2501.9.1 General. Aisles leading to required exits shall be provided from all portions of buildings. Aisles located within an accessible route of travel shall also comply with the Building Code for accessibility (see U.B.C. Chapter 11).

2501.9.2 Width without fixed seats. The width of aisles in assembly occupancies without fixed seats shall comply with Section 2501.9.2. Aisle widths shall be provided in accordance with the following:

1. In areas serving employees only, the minimum aisle width may be 24 inches (610 mm) but not less than the width required by the number of employees served.

2. In assembly occupancies without fixed seats, the minimum clear aisle width shall be 36 inches (914 mm) where tables, counters, furnishings, merchandise or other similar obstructions are placed on one side of the aisle only and 44 inches (1118 mm) when such obstructions are placed on both sides of the aisle.

2501.9.3 Width with fixed seats. Aisles in assembly occupancies with fixed seats shall comply with Section 2501.9.3. The clear width of aisles shall be based on the number of occupants within the portion of the seating areas served by the aisle.

The minimum clear width of aisles and other means of egress shall be in accordance with Table 2501-A or, for buildings providing smoke-protected assembly seating and for which an approved life-safety evaluation is conducted, in accordance with Table 2501-B. For Table 2501-B, the number of seats specified must be within a single assembly place, and interpolation shall be permitted between the specified values shown. For both tables, the minimum clear widths shown shall be modified in accordance with the following:

1. **Factor *A*:** If risers exceed 7 inches (178 mm) in height, multiply the stair width in the tables by factor A, where:

$$A = 1 + \frac{(\text{riser height} - 7.0 \text{ inches})}{5}$$

For SI:

$$A = 1 + \frac{(\text{riser height} - 178 \text{ mm})}{127}$$

2. **Factor *B*:** Stairs not having a handrail within a 30-inch (760 mm) horizontal distance shall be 25 percent wider than otherwise calculated. Multiply by factor *B*, where $B = 1.25$.

3. **Factor *C*:** Ramps steeper than 1 in 10 slope where used in ascent shall be 10 percent wider than otherwise calculated. Multiply by factor *C*, where $C = 1.10$.

Where exiting is possible in two directions, the width of such aisles shall be uniform throughout their length.

When aisles converge to form a single path of exit travel, the aisle width shall not be less than the combined required width of the converging aisle.

In assembly rooms with fixed seats arranged in rows, the clear width of aisles shall not be less than set forth above and not less than the following:

Forty-eight inches (1219 mm) for stairs having seating on both sides.

Thirty-six inches (914 mm) for stairs having seating on one side.

Twenty-three inches (584 mm) between a stair handrail and seating when the aisles are subdivided by the handrail.

Forty-two inches (1067 mm) for level or ramped aisles having seating on both sides.

Thirty-six inches (914 mm) for level or ramped aisles having seating on one side.

Twenty-three inches (584 mm) between a stair handrail and seating when an aisle does not serve more than five rows on one side.

2501.9.4 Aisle termination. Aisles shall terminate at a cross aisle, foyer, doorway or vomitory. Aisles shall not have a dead end greater than 20 feet (6096 mm) in length.

EXCEPTION: A longer dead-end aisle is permitted when seats served by the dead-end aisle are not more than 24 seats from another aisle measured along a row of seats having a minimum clear width of 12 inches (305 mm) plus 0.6 inch (15 mm) for each additional seat above seven in a row.

Each end of a cross aisle shall terminate at an aisle, foyer, doorway or vomitory.

2501.9.5 Ramp slope. The slope of ramped aisles shall not be more than 1 unit vertical in 8 units horizontal (12.5% slope). Ramped aisles shall have a slip-resistant surface.

EXCEPTION: When provided with fixed seating, theaters may have a slope not steeper than 1 unit vertical to 5 units horizontal (20% slope).

2501.9.6 Aisle steps.

2501.9.6.1 When prohibited. Steps shall not be used in aisles having a slope of 1 unit vertical to 8 units horizontal (12.5% slope) or less.

2501.9.6.2 When required. Aisles with a slope steeper than 1 unit vertical to 8 units horizontal (12.5% slope) shall consist of a series of risers and treads extending across the entire width of the aisle, except as provided in subsection 2501.9.5.

The height of risers shall not be more than 7 inches (178 mm) or less than 4 inches (102 mm) and the tread run shall not be less than 11 inches (279 mm). The riser height shall be uniform within each flight and the tread run shall be uniform throughout the aisle. Variations in run or height between adjacent treads or risers shall not exceed 3/16 inch (4.8 mm). A contrasting marking stripe or other approved marking shall be provided on each tread at the nosing or leading edge such that the location of each tread is readily apparent when viewed in descent. Such stripe shall be a minimum of 1 inch (25.4 mm) wide and a maximum of 2 inches (51 mm) wide.

EXCEPTION: When the slope of aisle steps and the adjoining seating area is the same, the riser heights may be increased to a maximum of 9 inches (229 mm) and may be nonuniform but only to the extent necessitated by changes in the slope of the adjoining seating area to maintain adequate sightlines. Variations may exceed 3/16 inch (4.8 mm) between adjacent risers provided the exact location of such variations is identified with a marking stripe on each tread at the nosing or leading edge adjacent to the nonuniform riser. The marking stripe shall be distinctively different from the contrasting marking stripe.

2501.9.7 Handrails. Handrails shall comply with the height, size and shape dimensions set forth in the Building Code (See U.B.C. Section 1006.9) and shall have rounded terminations or bends. Ramped aisles having a slope steeper than 1 unit vertical to 15 units horizontal (6.7 percent slope) and aisle stairs (two or more adjacent steps) shall have handrails located either at the side or within the aisle width. Handrails may project into the required aisle width a distance of 3½ inches (89 mm).

EXCEPTIONS: 1. Handrails may be omitted on ramped aisles having a slope not greater than 1 unit vertical in 8 units horizontal (12.5 percent slope) when fixed seating is on both sides of the aisle.

2. Handrails may be omitted when a guardrail is at the side of an aisle which conforms to the size and shape requirements for handrails.

Handrails located within the aisle width shall be discontinuous with gaps or breaks at intervals not to exceed five rows. These gaps or breaks shall have a clear width of not less than 22 inches (559 mm) and not more than 36 inches (914 mm) measured horizontally. Such handrails shall have an additional intermediate handrail located 12 inches (305 mm) below the main handrail.

2501.10 Seating.

2501.10.1 Spacing. When seating rows have 14 or less seats, the minimum clear width between rows shall not be less than 12 inches (305 mm) measured as the clear horizontal distance from the back of the row ahead and the nearest projection of the row behind. Where seats are automatic or self-rising, measurement may be made with the seats in the raised position. Where seats are not automatic or self-rising, the minimum clear width shall be measured with the seat in the down position.

The clear width shall be increased as follows:

1. For rows of seating served by aisles or doorways at both ends, there shall be no more than 100 seats per row and the minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.3 inch (7.62 mm) for every additional seat beyond 14, but the minimum clear width need not exceed 22 inches (559 mm). If the aisles are dead ended, see Section 2501.9.4 for further limitations.

2. For rows of seating served by an aisle or a doorway at one end only, the minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.6 inch (15 mm) for every additional seat beyond seven, but the minimum clear width need not exceed 22 inches (559 mm). In addition, the distance to the point where the occupant has a choice of two directions of travel to an exit shall not exceed 30 feet (9144 mm) from the point where the occupant is seated.

2501.10.2 Bonding of chairs. Loose seats, folding chairs or similar seating facilities that are not fixed to the floor shall be bonded together in groups of three or more.

EXCEPTIONS: 1. When not more than 300 such seats, chairs or facilities are provided, bonding is not required.
2. The bonding of chairs is not required when tables are provided, as when the occupancy is used for dining or similar purposes.

When bonding of chairs is required, aisles and exits shall be provided as required by Section 2501.9.3.

2501.10.3 Bleacher seats and grandstands. Bleacher seats and reviewing stands shall be in accordance with Sections 2502 and 2503.

2501.11 Use of Exit Ways. Interior and exterior stairways, smokeproof enclosures, hallways, corridors, vestibules, balconies and bridges leading to a stairway or an exit shall not be used in any way that will obstruct their use as an exit or that will present a hazardous condition.

2501.12 Ashtrays. Where smoking is allowed, approved noncombustible ashtrays or match receivers shall be provided on each table and at other convenient places.

2501.13 Fire Appliances. Fire appliances shall be kept in proper working condition. Extinguishers and hose and similar appliances shall be visible and accessible at all times. It shall be the duty of the owner and the occupant of each building or part of a building occupied as a place of assembly to properly train sufficient regular employees in the use of fire appliances. See also Section 1303.5.

2501.14 Plan of Exit Ways and Aisles. When required by the chief, a plan indicating the seating arrangements, location and width of exit ways and aisles shall be submitted for approval, and an approved copy of the plan shall be kept on display on the premises.

2501.15 Marking and Lighting of Exits. Exits in places of assembly shall be identified and lighted in accordance with Sections 1211 and 1212.

2501.16 Maximum Occupant Load.

2501.16.1 Posting of room capacity. Any room having an occupant load of 50 or more where fixed seats are not installed, and which is used for assembly purposes, shall have the capacity of the room posted in a conspicuous place on an approved sign near the main exit from the room. Such sign shall be maintained legible by the owner or the owner's authorized agent and shall indicate the number of occupants permitted for each room use.

2501.16.2 Determination of occupant load. The number of persons in a building or portion thereof shall not exceed the amount determined as specified in the Building Code, except that where such additional exit facilities are provided the occupant load can be increased by not more than 10 percent, when approved by the chief, without being considered overcrowding.

2501.16.3 Overcrowding. Overcrowding and admittance of persons beyond the approved capacity of a place of assembly are prohibited. The chief, upon finding overcrowding conditions or obstructions in aisles, passageways or other means of egress, or upon finding a condition which constitutes a serious menace to life, is authorized to cause the performance, presentation, spectacle or entertainment to be stopped until such condition or obstruction is corrected.

2501.17 Candles and other open-flame devices. Candles and other open-flame devices shall not be used in places of assembly or in drinking or dining establishments.

EXCEPTIONS: 1. When used in conjunction with approved heating or cooking appliances in areas not accessible to the public.
2. When used in conformance with Section 2501.18.

2501.18 Requirements for Use of Candles and Other Open-flame Devices.

2501.18.1 General. The use of candles and other open-flame devices shall be in accordance with Section 2501.18.

2501.18.2 Flaming foods and beverages. The preparation of flaming foods or beverages shall be in accordance with the following:

1. Flammable liquids used in the preparation of flaming foods and beverages shall be dispensed from one of the following:

1.1 A 1-ounce (29.6 mL) container, or

1.2 A container not to exceed 1 quart (946.4 mL) with a controlled pouring device that will limit the flow to 1 ounce (29.6 mL).

2. Flaming foods or beverages shall be prepared only in the immediate vicinity of the table being served. They shall not be transported or carried while burning,

3. The person preparing the flaming foods or beverages shall have a wet cloth towel immediately available for use in smothering the flames in the event of an emergency,

4. The serving of flaming foods or beverages shall be done in a safe manner and shall not create high flames. The pouring, ladling or spooning of liquids is restricted to a maximum height of 8 inches (203.2 mm) above the receiving receptacle, and

5. Containers shall be secured to prevent spillage when not in use.

2501.18.3 Candles and other open-flame decorative lighting. Candles and other open-flame decorative lighting shall be in accordance with the following:

1. Class I and II liquids and LP-gas shall not be used,

2. Liquid- or solid-fueled lighting devices containing more than 8 ounces (236.6 mL) must self-extinguish and not leak fuel at a rate of more than ¼ teaspoon per minute (1.26 mL per minute) if tipped over,

3. The device or holder shall be constructed to prevent the spilling of liquid fuel or wax at the rate of more than 1/4 teaspoon per minute (1.26 mL per minute) when the device or holder is not in an upright position,

4. The device or holder shall be designed so that it will return to the upright position after being tilted to an angle of 45 degrees from vertical,

EXCEPTION: Units that self-extinguish if tipped over and that do not spill fuel or wax at the rate of more than 1/4 teaspoon per minute (1.26 mL per minute) if tipped over.

5. The flame shall be enclosed, except as follows:

5.1 Openings on the sides shall not be more than 3/8 inch (9.5 mm) in diameter.

5.2 Openings on the top and the distance to the top shall be such that a single layer of tissue paper placed on the top will not ignite in 10 seconds.

6. Chimneys shall be made of noncombustible materials. Such chimneys shall be securely attached to the open-flame device,

EXCEPTION: The chimney need not be attached to any open-flame device that will self-extinguish if the device is tipped over.

7. Fuel canisters shall be safely sealed for storage,

8. Storage and handling of combustible liquid shall be in accordance with Article 79,

9. Shades, if used, shall be made of noncombustible materials and securely attached to the open-flame device holder or chimney,

10. Candelabra with flame-lighted candles shall be securely fastened in place to prevent overturning and located

away from occupants using the area and away from possible contact of drapes, curtains or other combustibles, and

11. When, in the opinion of the chief, adequate safeguards have been taken, hand-held flame-lighted candles can be allowed. Hand-held candles shall not be passed from one person to another while lighted.

2501.18.4 Theatrical performances. When approved by the chief, open-flame devices used in conjunction with theatrical performances are allowed to be used when adequate safety precautions have been taken.

2501.19 Standby Personnel. When, in the opinion of the chief, it is essential for public safety in a place of assembly or any other place where people congregate, due to the number of persons, or the nature of the performance, exhibition, display, contest or activity, the owner, agent or lessee shall employ one or more qualified persons, as required and approved by the chief, to be on duty at such place. Such individuals shall be subject to the chief's orders at all times when so employed and shall be in uniform and remain on duty during the times such places are open to the public, or when such activity is being conducted. Before each performance or the start of such activity, such individuals shall inspect the required fire appliances provided to see that they are in proper place and in good working order, and shall keep diligent watch for fires during the time such place is open to the public or such activity is being conducted and take prompt measures for extinguishment of fires that may occur. Such individuals shall not be required or permitted, while on duty, to perform any other duties than those herein specified.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-2501, filed 12/21/94, effective 6/30/95.]

WAC 51-34-5200 Article 52—Motor vehicle fuel-dispensing stations.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-5200, filed 12/21/94, effective 6/30/95.]

WAC 51-34-5201 Section 5201—General.

5201.1 Scope. Automotive, marine and aircraft motor vehicle fuel-dispensing stations shall be in accordance with Article 52 and U.F.C. Standard 52-1. Such operations shall include both public accessible and private operations. Flammable and combustible liquids and LP-gas shall also be in accordance with Articles 79 and 82.

EXCEPTIONS: Class II or III liquids may be transferred from tank vehicles into fuel tanks of motor vehicles when approved by the chief, and under the following conditions:
1. Only diesel fuel will be allowed and each premises shall require a separate permit issued in accordance with Section 105,
2. Tank vehicles shall meet the requirements of DOT and U.F.C. Standard 79-4 and as approved by the chief,
3. The tank vehicle, while in service, shall not be left unattended,
4. A fire extinguisher with a classification of 2A-20BC shall be readily available at the fueling site,
5. There shall be signs stating "NO SMOKING OR OPEN FLAME WITHIN 25 FEET (7620 mm)" readily visible at the fueling site,
6. There shall be adequate lighting for night time operations,
7. For other than marine motor vehicles, the fuel hose shall not exceed 50 feet (15 240 mm) in length,
8. Approved automatic closing nozzles without a latch open device shall be used,
9. Communication devices shall be available in accordance with Section 5201.6.3,
10. Tank vehicles shall have emergency shut off valves as approved by the chief,
11. Dispensing shall be done in accordance with Section 7903.3.3,
12. At least 20 feet (6096 mm) from any source of ignition,
13. The applicant shall comply with all applicable federal, state and local environmental laws and regulations as a condition of permit,
14. The private fueling area shall be located on an area graded in a manner to direct the spill away from buildings, storage and property lines.

5201.2 Definitions. For definitions of CNG, COMBUSTIBLE LIQUID, FLAMMABLE LIQUID and MOTOR VEHICLE FUEL-DISPENSING STATION, see Article 2.

5201.3 Permits and Plans.

5201.3.1 Permits. Permits are required for motor vehicle fuel-dispensing stations. See Section 105, Permit m.4.

5201.3.2 Plans and specifications. Plans and specifications shall be submitted for review and approval prior to the installation or construction of a motor vehicle fuel-dispensing station. A site plan shall be submitted which illustrates the location of flammable liquid, LP-gas or CNG storage vessels, and their spatial relation to each other, property lines and building openings. Both aboveground and underground storage vessels shall be shown on plans. For each type of station, plans and specifications shall include, but not be limited to, the following:

1. **Flammable and Combustible Liquids:** the type and design of underground and aboveground liquid storage tanks; the location and design of the fuel dispensers and dispenser nozzles; the design and specifications for related piping, valves and fittings; the location and classification of electrical equipment, including emergency fuel shutdown devices; and specifications for fuel storage and venting components.

2. **Liquefied Petroleum Gas:** equipment and components as required in U.F.C. Standard 82-1; the location and design of the LP-gas dispensers and dispenser nozzles; the design, specifications and location for related piping, valves and fittings; the location and classification of electrical equipment, including emergency fuel shutdown devices; and specifications for fuel storage and pressure-relief components.

3. **Compressed Natural Gas:** when provided, the location of CNG compressors; the location and design of CNG dispensers and vehicle fueling connections; the design, specification and location for related piping, valves and fittings; the location and classification of electrical equipment, including emergency fuel shutdown devices; and specifications for fuel storage and pressure-relief components.

5201.4 Location of Dispensing Operations and Storage Vessels.

5201.4.1 Dispensing operations.

5201.4.1.1 General. Flammable and combustible liquids, CNG and LP-gas shall not be dispensed in buildings and dispensers for such products shall not be located in buildings.

EXCEPTIONS: 1. Dispensing of flammable and combustible liquids inside buildings in accordance with Section 5202.
2. Dispensing of compressed natural gas (CNG) in accordance with Section 5204.

See Sections 5202, 5203 and 5204 for additional requirements.

5201.4.1.2 Dispensing devices. Dispensing devices shall be located as follows:

1. Ten feet (3048 mm) or more from property lines,

2. Ten feet (3048 mm) or more from buildings having combustible exterior wall surfaces or buildings having noncombustible exterior wall surfaces that are not part of a one-hour fire- resistive assembly,

EXCEPTION: Weather protection shelters constructed in accordance with Uniform Fire Code Standard 52-1.

3. Such that all portions of the vehicle being fueled will be on the premises of the motor vehicle fuel-dispensing station,

4. Such that the nozzle, when the hose is fully extended, will not reach within 5 feet (1524 mm) of building openings, and

5. Twenty feet (6096 mm) or more from fixed sources of ignition.

5201.4.1.3 Bulk plants. Motor vehicle fuel-dispensing stations located at bulk plants shall be separated by a fence or similar barrier from the area in which bulk operations are conducted. See also Section 5202.3.1.

5201.4.2 Storage Vessels. Storage vessels for LP-gas and CNG shall be located 20 feet (6096 mm) or more from aboveground tanks containing flammable or combustible liquids.

5201.5 Installation of Dispensing Devices.

5201.5.1 Protection of dispensers. Dispensing devices shall be protected against physical damage from vehicles by mounting on a concrete island 6 inches (152.4 mm) or more in height or by other approved methods.

5201.5.2 Dispenser installation. Dispensing devices shall be secured in an approved manner. Dispensers shall not be secured to the island using piping or conduit.

5201.5.3 Emergency shutdown devices. Emergency shutdown devices shall be provided for all fuel dispensers. Emergency shutdown devices for exterior fuel dispensers shall be located within 100 feet (30 480 mm) of, but not less than 20 feet (6096 mm) from, dispensers. For interior fuel-dispensing operations, the emergency shutdown devices shall be installed at approved locations. Activation of the emergency shutdown devices shall stop the transfer of fuel to the dispensers and close all valves which supply fuel to the dispensers. Such devices shall be distinctly labeled EMERGENCY FUEL SHUTDOWN DEVICE. Signs shall be provided in approved locations.

5201.5.4 Dispenser electrical disconnects. An electrical disconnect switch shall be provided for all dispensers in accordance with the Electrical Code. The disconnect shall be placed in the OFF position before repairing dispensers and before closing a motor vehicle fuel-dispensing station.

5201.6 Supervision of Dispensing Operations.

5201.6.1 General. The dispensing of fuel into the fuel tanks of automobile, marinecraft or aircraft, or portable containers shall be under the supervision of a qualified attendant at all times.

EXCEPTION: Unsupervised dispensing of flammable and combustible liquids, LP-gas and CNG as a motor fuel is allowed in accordance with Sections 5201.6.3, 5202, 5203 and 5204.

5201.6.2 Attendants. The attendant's primary function shall be to supervise, observe and control the dispensing of motor fuels. The attendant shall prevent the dispensing of flammable and combustible liquids and flammable gases into containers not in compliance with this code, control sources of ignition, give immediate attention to accidental spills or releases, and be prepared to use fire extinguishers. A method of communicating with the fire department shall be provided for the attendant.

5201.6.3 Unsupervised dispensing. Unsupervised dispensing is allowed when the owner or operator provides, and is accountable for, daily site visits, regular equipment inspection and maintenance, conspicuously posted instructions for the safe operation of dispensing equipment, and posted telephone numbers for the owner or operators. A sign, in addition to the signs required by Section 5201.8 shall be posted in a conspicuous location reading:

IN CASE OF FIRE, SPILL OR RELEASE
1. Use emergency pump shutoff!
2. Report the accident!
Fire Department Telephone No._____
Facility address_____

During hours of operation, stations having unsupervised dispensing shall be provided with a fire alarm transmitting device. A telephone not requiring a coin to operate is acceptable.

5201.7 Sources of Ignition. Electrical equipment shall be in accordance with the Electrical Code.

Smoking and open flames shall be prohibited in areas where fuel is dispensed. The engines of vehicles being fueled shall be stopped.

5201.8 Signs. Signs prohibiting smoking, prohibiting dispensing into unapproved containers and requiring vehicle engines to be stopped during fueling shall be conspicuously posted within sight of each dispenser.

5201.9 Fire Protection. Portable fire extinguishers shall be provided as set forth in U.F.C. Standard 10-1.

5201.10 Clearance from Combustible Materials. Weeds, grass, brush, trash and other combustible materials shall be kept not less than 10 feet (3048 mm) from fuel storage vessels and fuel-handling equipment.

5201.11 Maintenance. Fueling systems shall be maintained in proper operating condition.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-5201, filed 12/21/94, effective 6/30/95.]

WAC 51-34-5204 Section 5204—Compressed natural gas motor vehicle fuel-dispensing stations.

5204.1 General. Automotive, marine and aircraft motor vehicle fuel-dispensing stations utilizing CNG shall be in accordance with Section 5204.

5204.2 Standards. Compressed natural gas motor vehicle fuel-dispensing operations and facilities shall be in accordance with U.F.C. Standard 52-1.

5204.3 Approvals.

5204.3.1 General. Storage vessels and equipment used for the storage, compression or dispensing of CNG shall be approved or listed in accordance with Section 5204.3.

5204.3.2 Approved equipment. Containers; compressors; pressure-relief devices, including pressure-relief valves; and pressure regulators and piping used for CNG shall be approved.

5204.3.3 Listed equipment. Hoses, hose connections, dispensers, gas-detection systems and electrical equipment used for CNG shall be listed. Vehicle fueling connections shall be listed and labeled.

5204.4 Attendants. Motor vehicle fueling operations shall be conducted by qualified attendants or in accordance with Section 5204.6 by persons trained in the proper handling of CNG.

5204.5 Location of Dispensing Operations and Equipment.

5204.5.1 General. Compression, storage and dispensing equipment shall be located aboveground.

5204.5.2 Maximum capacity within established limits. Within the limits established by law restricting the storage of CNG for the protection of heavily populated or congested commercial areas, the aggregate capacity of any one installation shall not exceed 183,000 cubic feet (5 181 974 L).

5204.5.3 Location on property. In addition to the requirements of Section 5201.4, compression, storage and dispensing equipment shall be installed as follows:

1. Not beneath power lines,

2. Ten feet (3048 mm) or more from the nearest building or property line which could be built on, public street, sidewalk, or source of ignition, and

3. Twenty-five feet (7620 mm) or more from the nearest rail of any railroad track and 50 feet (15 240 mm) or more from the nearest rail of any railroad main track or any railroad or transit line where power for train propulsion is provided by an outside electrical source such as third rail or overhead catenary.

4. Fifty feet (15 240 mm) or more from the vertical plane below the nearest overhead wire of a trolley bus line.

EXCEPTION: Vehicle Fueling Appliances located in accordance with Uniform Fire Code Standard 52-1.

5204.6 Private Fueling of Motor Vehicles. Self-service CNG-dispensing systems, including key, code and card lock dispensing systems, shall be limited to the filling of permanently mounted fuel containers on CNG-powered vehicles.

In addition to the requirements in Section 5201.6, self-service CNG-dispensing systems shall be in accordance with the following:

1. The system shall be provided an emergency shutoff switch located within 100 feet (30 480 mm) of, but not less than 20 feet (6096 mm) from dispensers, and

2. The owner of the dispensing facility shall ensure the safe operation of the system and the training of users.

5204.7 Pressure Regulators. Pressure regulators shall be designed, installed or protected so their operation will not be affected by the elements (freezing rain, sleet, snow or ice), mud or debris. This protection is allowed to be integral with the regulator.

5204.8 Valves. Gas piping to equipment shall be provided with a remote, readily accessible manual shutoff valve.

5204.9 Emergency Shutdown Equipment. An emergency shutdown device shall be located within 100 feet (30 480 mm) of, but not less than 20 feet (6096 mm) from, dispensers and shall also be provided in the compressor area. Upon activation, the emergency shutdown shall automatically shut off the power supply to the compressor and close valves between the main gas supply and the compressor and between the storage containers and dispensers.

5204.10 Discharge of CNG from Motor Vehicle Fuel Storage Containers.

5204.10.1 Applicability. The discharge of CNG from motor vehicle fuel cylinders for the purposes of maintenance, cylinder certification, calibration of dispensers or other activities shall be in accordance with Section 5204.10.

5204.10.2 Methods.

5204.10.2.1 General. The discharge of CNG from motor vehicle fuel cylinders shall be accomplished through a use-closed transfer system or an approved method of atmospheric venting.

5204.10.2.2 Use-closed transfer system. A documented procedure which explains the logical sequence for discharging the cylinder shall be provided to the chief for review and approval. The procedure shall include what actions the operator will take in the event of a low-pressure or high-pressure natural gas release during the discharging activity. A drawing illustrating the arrangement of piping, regulators and equipment settings shall be provided to the chief for review and approval. The drawing shall illustrate the piping and regulator arrangement and shall be shown in spatial relation to the location of the compressor, storage vessels and emergency shutdown devices.

5204.10.2.3 Atmospheric venting.

5204.10.2.3.1 Plans and specifications. A drawing illustrating the location of the vessel support, piping, the method of grounding and bonding, and other requirements

specified herein shall be provided to the chief for review and approval.

5204.10.2.3.2 Cylinder stability. A method of rigidly supporting the vessel during the venting of CNG shall be provided. The selected method shall provide not more than two points of support and shall prevent the horizontal and lateral movement of the vessel. The system shall be designed to prevent the movement of the vessel based on the highest gas-release velocity through valve orifices at the vessel's rated pressure and volume. The structure or appurtenance shall be constructed of noncombustible materials.

5204.10.2.3.3 Separation. The structure or appurtenance used for stabilizing the cylinder shall be separated from the site equipment, features and exposures and shall be located in accordance with Table 5204.10-A.

5204.10.2.3.4 Grounding and bonding. The structure or appurtenance used for supporting the cylinder shall be grounded in accordance with the Electrical Code. The cylinder valve shall be bonded prior to the commencement of venting operations.

5204.10.2.3.5 Vent tube. A vent tube which will divert the gas flow to atmosphere shall be installed on the cylinder prior to the commencement of venting and purging operation. The vent tube shall be constructed of pipe or tubing materials in accordance with Article 90, Standard No. a.1.5.

Piping materials specified in Section 2-8.4 of U.F.C. Standard 52-1 shall not be used. The vent tube shall be capable of dispersing the gas a minimum of 10 feet (3048 mm) above grade level. The vent tube shall not be provided with a rain cap or other feature which would limit or obstruct the gas flow.

At the connection fitting of the vent tube and the CNG cylinder, a listed bidirectional detonation flame arrester shall be provided.

5204.10.2.3.6 Signage. Approved NO SMOKING signs shall be posted within 10 feet (3048 mm) of the cylinder support structure or appurtenance. Approved CYLINDER SHALL BE BONDED signs shall be posted on the cylinder support structure or appurtenance.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-5204, filed 12/21/94, effective 6/30/95.]

WAC 51-34-6100 Article 61—Oil-burning equipment.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-6100, filed 12/21/94, effective 6/30/95.]

WAC 51-34-6103 Section 6103—Permits. See Section 105.8 for permits. A permit is required to remove, abandon, place temporarily out of service or otherwise dispose of a combustible liquids tank.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-6103, filed 12/21/94, effective 6/30/95.]

WAC 51-34-6104 Section 6104—Electrical wiring and equipment. Electrical wiring and equipment used in connection with oil-burning equipment shall be installed in accordance with the Electrical Code.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-6104, filed 12/21/94, effective 6/30/95.]

WAC 51-34-6105 Section 6105—Fuel oil. The fuel oil used in a burner shall be of a type approved for the burner and in accordance with the burner manufacturer's recommendations.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-6105, filed 12/21/94, effective 6/30/95.]

WAC 51-34-6106 Section 6106—Abandonment of tanks. Tanks and piping serving oil-burning equipment which have been out of service for a period of one year shall be removed from the ground or abandoned in place in accordance with Section 7902.1.7 of this code.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-6106, filed 12/21/94, effective 6/30/95.]

WAC 51-34-6107 Section 6107—Portable unvented oil-burning heating appliances and unvented decorative gas logs and fireplaces.

6107.1 General. The design, construction and use of portable unvented oil-burning heating appliances shall be in accordance with Section 6107 and other applicable provisions of this code.

6107.2 Equipment. Portable unvented oil-burning heating appliances shall be listed and shall be limited to a fuel tank capacity of 2 gallons (7.6 L).

EXCEPTION: Appliances approved for temporary use during construction processes are allowed to have a greater fuel tank capacity, provided such capacity does not exceed the terms of the listing of the appliance.

6107.3 Location. The use of listed portable unvented oil-burning heating appliances shall be limited to supplemental heating in Groups S, Divisions 3, 4, and 5 and Group U Occupancies.

EXCEPTIONS:
1. When approved by the chief, portable unvented oil-burning heating appliances may be used in any occupancy during construction when such use is necessary for the construction and the use does not represent a hazard to life or property.
2. Approved, unvented portable oil-fueled heaters may be used as a supplemental heat source in any Group B, F-2, M, R or U Occupancy provided that such heaters shall not be located in any sleeping room or bathroom, and shall comply with RCW 19.27A.080, 19.27A.090, 19.27A.100, 19.27A.110, and 19.27A.120.
3. Approved, unvented decorative gas logs and decorative fireplaces may be installed, used, maintained and permitted to exist in any Group I or R Occupancy, except bathrooms and bedrooms. An unvented decorative gas log is a listed natural or liquefied petroleum gas burning log with an open flame consisting of a metal frame or base supporting simulated logs which is designed so that its primary function lies in the aesthetic effect of the logs and flame. An unvented decorative fireplace is a listed unvented gas log permanently installed in a freestanding enclosure or zero clearance enclosure designed and approved for installation in walls or other building structures. Unvented decorative gas logs and fireplaces shall:
   1. Be equipped with an approved oxygen-depletion sensor,

2. Be listed,
3. Not be installed in any room which does not have an alternative primary source of heat,
4. Have free air volume of at least 50 cubic feet (1.4 m^3) for each 1,000 Btu (2.2 mm^2/W) of thermal output,
5. Be permanently installed, and
6. Not be equipped with or connected to any automatic ignition or shut-off device except the oxygen-depletion sensor.

6107.4 Fuel. The grade and type of fuel shall be in accordance with the listing for the appliance. Storage and handling of fuel shall be in accordance with Article 79.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-6107, filed 12/21/94, effective 6/30/95.]

ARTICLE 63—REFRIGERATION

WAC 51-34-6301 Scope.

6301.1 This article shall govern the design, installation, construction and repair of refrigeration systems that vaporize and liquify a fluid during the refrigerating cycle. Refrigerant piping design and installation, including pressure vessels and pressure relief devices, shall conform to this code. Permanently installed refrigerant storage systems and other components shall be considered as part of the refrigeration system to which they are attached.

6301.2 Refrigeration unit and system installations having a refrigerant circuit containing more than 220 pounds (100 kg) of Group A1 or 30 pounds (13.6 kg) of any other group refrigerant shall be in accordance with Article 63 and the Mechanical Code. See the Mechanical Code for refrigerant group descriptions. See also Sections 8001.1.2 and 8002.

EXCEPTION: The chief is authorized to exempt temporary or portable installations.

6301.3 Refrigeration systems shall comply with the requirements of this code and, except as modified by this code, ASHRAE 15 - 1994. Ammonia refrigerating systems shall comply with this code and, except as modified by this code, ASHRAE 15 - 1994 and IIAR 2 - 1992.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6301, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6302 Classification.

Refrigerants shall be classified into groups in accordance with the Mechanical Code. See Appendix VI-F.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6302, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6303 Definitions.

For definitions of IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH), LOWER FLAMMABILITY LIMIT (LFL), PERMISSIBLE EXPOSURE LIMIT (PEL) AND REFRIGERANT, See Article 2. For refrigerant groups, see Appendix VI-F.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6303, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6304 Permits and plans.

For a permit to install or operate a refrigeration system, see Section 105, Permit r.2. When required by the chief, applications for permits shall also be in accordance with Section 8001.3.

Plans and specifications for devices and systems required by Article 63 shall be submitted to the fire department for review and approval prior to installation.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6304, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6305 Installation and maintenance.

Refrigeration systems shall be installed and maintained in a safe manner which will minimize the life, health, and fire hazard of the installation. Installation shall be in accordance with the Mechanical Code. Also see Sections 6313.2.4 and 6320.2.

Refrigeration systems shall be safely maintained in an operable condition, free from accumulations of oil, dirt, waste, excessive corrosion, other debris, or leaks.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6305, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6306 Access.

Refrigeration systems shall be accessible to the fire department at all times as required by the chief. See also Sections 6310.2 and 6315.3.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6306, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6307 Emergency control box.

6307.1 Location. When required by Article 63 or the Mechanical Code, control boxes shall be located outside of the building adjacent to a street or at an approved accessible location. All portions of the control box shall be 6 feet (1829 mm) or less above the adjoining grade.

6307.2 Valve Operational Procedure. Valves and switches shall be adequately identified as to the sequential procedure to be followed in the event of an emergency.

6307.3 Control Boxes. Control boxes shall be of iron or steel not less than 0.055 inch (1.4 mm) (16 gage) thickness and provided with a hinged cover and lock.

6307.4 Identification. Control boxes shall be provided with a permanent label on the outside cover reading FIRE DEPARTMENT - EMERGENCY CONTROL BOX and including the name of the refrigerant in the system. Hazard identification in accordance with U.F.C. Standard 79-3 shall be posted inside and outside of the control box.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6307, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6308 Treatment and flaring systems for discharge.

6308.1 General.

6308.1.1 Applicability. Refrigeration systems which are designed to discharge refrigerant vapor to atmosphere shall

be provided with an approved treatment or flaring system when required by Section 6308.1. Also see Section 6314.1.

EXCEPTIONS: 1. Ammonia systems complying with Section 6309.
2. Ammonia absorption systems serving a single dwelling unit.

6308.1.2 Toxic and Highly Toxic Refrigerants. Systems containing refrigerants which are toxic or highly toxic shall discharge vapor to atmosphere only through an approved treatment system. Treatment systems shall be in accordance with Sections 8003.3.1.3.5.1, 8003.3.1.3.5.2 and 8003.3.1.3.5.3.

6308.1.3 Flammable Refrigerants. Systems containing refrigerants which are flammable shall discharge vapor to the atmosphere only through an approved treatment or flaring system. Flaring systems shall be in accordance with Section 6308.2.

6308.2 Flaring System Design Requirements. Flaring systems for incineration of flammable refrigerants shall be designed to incinerate the entire discharge. The products of refrigerant incineration shall not pose health or environmental hazards. Incineration shall be automatic upon initiation of discharge, shall be designed to prevent blowback, and shall not expose structures or materials to threat of fire. Standby fuel, such as LP-gas, and standby power shall have the capacity to operate for one and one half the required time for complete incineration of refrigerant in the system.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6308, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6309 Ammonia discharge.

Ammonia refrigeration systems shall be designed and installed in accordance with ASHRAE 15 - 1994 Section 9.7.8.2, Ammonia Discharge.

EXCEPTION: An emergency discharge is not required for ammonia-water absorption unit systems installed outdoors provided that the discharge is shielded and dispersed.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6309, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6310 Refrigeration machinery rooms.

6310.1 When Required. Where required by UMC Table 1104.2(1), a machinery room shall be provided to enclose refrigeration systems located indoors. Access to the machinery room shall be restricted to authorized personnel. For rooms where occupational exposure could occur, see WAC 296-62-07515 and 296-62-3112.

6310.2 Dimensions. A machinery room shall be dimensioned so as to provide clearances required by UMC Chapter 3. There shall be clear head room of not less than 7 feet 3 inches (2210 mm).

6310.3 Exits. Exits shall comply with Uniform Building Code Section 1020 - Special Hazards.

Each machinery room shall be provided with a minimum of one exit door that opens directly to the outside.

EXCEPTION: Self-closing, tight-fitting doors opening into a vestibule leading directly outside.

6310.4 Refrigerant-vapor Alarms. Machinery rooms shall contain a refrigerant vapor detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant vapor from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV - TWA values shown in UMC Table 1104.1. Detectors and alarms shall be placed in approved locations.

EXCEPTION: Detectors are not required for ammonia systems complying with UMC Section 1106.8.

6310.5 Separation. Refrigeration machinery rooms shall be separated from other portions of the building as required in the special hazards provisions of the Building Code. Penetrations shall be sealed to inhibit the passage of refrigerant vapor.

6310.6 Combustion Air and Return Air. Combustion air or return air shall not be taken from or through a refrigeration machinery room.

EXCEPTIONS: 1. Refrigeration machinery rooms used exclusively for direct-fired absorption equipment.
2. Direct-vented combustion equipment.

6310.7 Special Requirements. Open flames that use combustion air from the machinery room shall not be installed in a machinery room.

EXCEPTIONS: 1. Matches, lighters, halide leak detectors and similar devices.
2. Where the refrigerant is carbon dioxide or water.
3. Fuel burning equipment shall not be prohibited in the same machinery room with refrigerant - containing equipment where combustion air is ducted from outside the machinery room and sealed in such a manner as to prevent any refrigerant leakage from entering the combustion chamber, or where a refrigerant vapor detector is employed to automatically shut off the combustion process in the event of refrigerant leakage.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6310, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6311 Refrigeration machinery room ventilation.

6311.1 General. Machinery rooms shall be mechanically ventilated to the outdoors. Mechanical ventilation shall be capable of exhausting the minimum quantity of air both at the normal operating and emergency conditions. Multiple fans or multispeed fans shall be allowed in order to produce the emergency ventilation rate to obtain a reduced airflow for normal ventilation.

EXCEPTION: Where a refrigerating system is located outdoors more than 20 feet (6096 mm) from any building opening and is enclosed by a penthouse, lean - to or other structure, natural or mechanical ventilation shall be provided in accordance with UMC Section 1105.9.

6311.2 Distribution of Ventilation. Provisions shall be made for supply air to replace that being exhausted. Openings for supply air shall be located to avoid intake of exhaust air. Air supply and exhaust ducts to the machinery room shall comply with the provisions of UMC Section 1105.9.

6311.3 Intermittent Control of Ventilation Systems. Fans providing refrigeration machinery room temperature control or automatic response to refrigerant vapor are allowed to be

automatically controlled to provide intermittent ventilation as conditions require.

6311.4 Emergency Control of Ventilation Systems. Fans providing emergency purge ventilation for refrigerant escape shall have a clearly identified switch of the break-glass type providing on-only control immediately adjacent to and outside of each refrigerant machinery room exit. Purge fans shall also respond automatically to the refrigerant concentration detection system set to activate the ventilation system at values not greater than the corresponding TLV - TWA values shown in UMC Table 1104.1. Ventilation equipment in ammonia machinery rooms equipped with a refrigerant vapor detector that will automatically start the ventilation system and actuate an alarm may be set at detection levels which exceed those in UMC Table 1104.1 but such detection level setting shall not exceed 1,000 ppm. An emergency purge control shall be provided with a manual reset only.

6311.5 Central Control of Ventilation Systems. Mechanical ventilation systems shall have switches to control power to each fan. The switches shall be key operated or within a locked glass-covered enclosure at an approved location adjacent to and outside of the principal entrance to the machinery room. Necessary keys shall be located in a single approved location. Switches controlling fans providing continuous ventilation shall be of the two-position, on/off type. Switches controlling fans providing intermittent or emergency ventilation shall be of the three-position, automatic/on/off type. Switches shall be labeled identifying both function and specific fan controlled. Two-colored and labeled indicator lamps responding to the differential pressure created by air flow shall be provided for each switch. One lamp shall indicate flow, the other shall indicate no flow.

6311.6 Ventilation Discharge. Exhaust from mechanical ventilation systems shall be discharged 20 feet (6096 mm) or more from a property line or openings into buildings. Also see Section 6308.

6311.7 Fans. Fans and associated equipment intended to operate the emergency purge of other than Group A1 or Group B1 refrigerants shall meet the requirements for a Class I, Division 1 hazardous location as specified in the Electrical Code.

EXCEPTION: Ammonia machinery rooms.

6311.8 Ventilation Intake. Makeup-air intakes to replace the exhaust air shall be provided to the refrigeration machinery room directly from outside the building. Intakes shall be located as required by the Mechanical Code and fitted with backdraft dampers or similar approved flow-control means to prevent reverse flow. Distribution of makeup air shall be arranged to provide thorough mixing within the refrigeration machinery room to prevent short circuiting of the makeup air directly to the exhaust.

6311.9 Ventilation Rate. Ventilation rate shall be in accordance with the Building and Mechanical Codes.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6311, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6312 Refrigerated process and storage areas.

Refrigerant quantities in evaporators and piping within rooms or spaces used exclusively for processing or storage of materials under refrigerated conditions shall not be limited provided that exiting is provided in accordance with the Building Code for special hazards and:

1. The refrigerated room or space is equipped with a refrigerant vapor-detection and alarm system complying with Section 6313, and
2. The refrigerated room or space is sealed from all other portions of the building by vaportight construction and tightfitting, gasketed doors.

EXCEPTION: Adjoining refrigerated rooms need not be separated by vaportight construction.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6312, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6313 Detection and alarm systems.

6313.1 General. When required by this article, approved refrigerant vapor-detection devices shall be connected to alarm systems utilizing listed fire alarm signaling devices capable of generating a sound level of at least 15dB above the operating ambient sound pressure level of the space in which they are installed and providing an approved, distinctive audible and visual alarm. See Sections 6314.1 and 8003.1.15.

6313.2 Detection Thresholds.

6313.2.1 Alarm. Refrigerant vapor alarms shall be activated at a value not greater than the corresponding TLV - TWA values shown in UMC Table 1104.1.

EXCEPTION: Alarms in ammonia machinery rooms may be activated by a detector setting not to exceed 1,000 ppm when the activation of the detector will automatically start the ventilation system.

6313.2.2 Power and Supervision. Detection and alarm systems shall be powered and supervised as required for fire alarm systems in accordance with U.F.C. Standard 10-2.

6313.2.3 Monitoring and Annunciation. Detection and alarm systems shall be remotely annunciated at an approved constantly attended location as required for fire alarm systems in accordance with Article 10.

6313.2.4 Installation and Maintenance. Detection and alarm systems shall be installed and maintained as required for fire alarm systems in accordance with Article 10 and U.F.C. Standards 10-2 and 10-4. Also see Section 6320.1.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6313, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6314 Refrigeration machinery room equipment and controls.

6314.1 General. Equipment, piping, ducts, vents or similar devices which are not essential for the refrigeration process, maintenance of the equipment, or illumination, ventilation, or fire protection of the room shall not be placed in or pass through a refrigeration machinery room.

Equipment essential to the refrigeration process often includes, but is not always limited to, the following:

refrigeration compressors; condensing units; pumps, associated piping and automatic control valves for refrigerant, condenser water, and brine or chilled water; refrigeration control devices and panels; machinery room ventilation equipment; cooling towers or portions thereof; refrigerant receivers and accumulators; refrigerant vapor-detection and alarm systems; machinery room fire sprinkler system exclusive of shutoff valves; machinery room lighting and service receptacles; and motor control centers and electrical panels for machinery room systems.

6314.2 Electrical. Electrical equipment and installations shall comply with the Electrical Code. The refrigeration machinery room shall not be required to be classified as a hazardous location for electrical equipment except as provided in the Mechanical Code and Article 63.

6314.3 Storage. Storage of materials in a refrigeration machinery room shall be in accordance with other applicable articles of this code.

6314.4 Emergency Control. A clearly identified switch of the break-glass type providing off-only control of electrically energized equipment and devices within the refrigeration machinery room shall be provided immediately adjacent to and outside of each refrigeration machinery room exit.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6314, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6315 Refrigerant control valves.

6315.1 Location. Stop valves shall be installed in the refrigerant piping of a refrigeration system at the following locations:

1. At the inlet and outlet of a positive-displacement-type compressor, compressor unit or condensing unit,
2. At the refrigerant outlet from a liquid receiver, and
3. At the refrigerant inlet of a pressure vessel containing liquid refrigerant and having an internal gross volume exceeding 3 cubic feet (85 L).

EXCEPTIONS:
1. Systems with nonpositive-displacement compressors.
2. Systems having a pump-out receiver for storage of the charge.
3. Systems containing less than 110 pounds (50 kg) of Group A1 refrigerant.
4. Self-contained systems do not require a stop valve at the inlet of the receiver.

6315.2 Support. Stop valves installed in copper refrigerant lines of 7/8 inch (22 mm) or less outside diameter shall be securely supported independently of the tubing or piping.

6315.3 Access. Stop valves required by Section 6315 shall be readily accessible from the refrigeration machinery room floor or a level platform.

6315.4 Identification. Stop valves shall be identified by tagging in accordance with Section 6319. A valve chart shall be mounted under glass at an approved location near the principal entrance to a refrigeration machinery room.

6315.5 Piping Identification. Piping shall be identified in accordance with Section 6319. The type of refrigerant, function and pressure shall be indicated.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6315, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6316 Protection from mechanical damage.

Refrigeration systems and portions thereof shall not be located in an elevator shaft, dumbwaiter shaft, or a shaft having moving objects therein, nor in a location where they will be subject to mechanical damage. Equipment subject to vehicular damage shall be protected in accordance with Section 8001.9.3.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6316, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6317 Electrical.

6317.1 General. Electrically energized components of refrigeration systems shall conform to the Electrical Code. See also Section 6314.2.

6317.2 Secondary Source. When treatment, detection or alarm systems are required, such systems shall be connected to a secondary source of power to automatically supply electrical power in the event of loss of power from the primary source. See Electrical Code.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6317, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6318 Instructions.

The person in charge of premises on which a refrigeration unit or system is installed shall provide an approved card located in the emergency control box designating:

1. Instructions for suspending operation of the system in the event of an emergency,
2. The name, address, and emergency telephone numbers to obtain emergency service,
3. The name, address, and telephone number of the fire department with instructions to notify the fire department in the event of an emergency,
4. The names, addresses, and telephone numbers of all corporate, local, state, and federal agencies to be contacted as required in the event of a reportable incident, and,
5. The location and operation of emergency discharge systems when such systems are required by Article 63.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6318, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6319 Emergency signs and labels.

Refrigeration units or systems shall be provided with approved emergency signs, charts, and labels in accordance with the Mechanical Code, U.F.C. Standard 79-3, and the Mechanical Code (see U.M.C. Standard 11-2). See also Appendix VI-F.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6319, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6320 Testing of equipment.

6320.1 Acceptance Testing. The following emergency devices or systems shall be tested to demonstrate their safety and effectiveness upon completion or alteration:

1. Treatment and flaring systems,
2. Ammonia diffusion systems,

3. Valves and appurtenances necessary to the operation of emergency refrigeration control boxes,

4. Fans and associated equipment intended to operate emergency purge ventilation systems, and

5. Detection and alarm systems.

Fire alarm systems shall be tested in accordance with U.F.C. Standards 10-2 and 10-4.

6320.2 Periodic Testing. The following emergency devices or systems shall be tested in accordance with the manufacturer's instructions and as required by the chief:

1. Treatment and flaring systems,

2. Valves and appurtenances necessary to the operation of emergency refrigeration control boxes,

3. Fans and associated equipment intended to operate emergency purge ventilation systems, and

4. Detection and alarm systems. See Section 6313.2.4. Also see Section 6305.

6320.3 Records. A written record of required testing shall be maintained on the premises.

6320.4 Frequency of Testing. Unless otherwise required by the chief, testing frequency shall be in accordance with Section 6320.2.

6320.5 Personnel Qualifications. Tests of emergency devices or systems required by Article 63 shall be conducted by approved persons.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6320, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6321 Notification of discharges.

The fire department shall be notified immediately upon discharge of refrigerant, whether automatic or manual. Refrigerant shall not be discharged except in an emergency. Notification shall comply with Section 8001.5.2.2.

EXCEPTIONS: 1. Refrigeration systems operating at pressures below atmospheric and incorporating automatic purge cycles.
2. Incidental operation of automatic pressure-relief valves resulting in minor release of the refrigerant charge.
3. Incidental minor releases associated with service operations after system pump down has been accomplished.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6321, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6322 Storage, handling and use.

Flammable and combustible materials shall not be stored in machinery rooms. Storage, use, and handling of extra refrigerant or refrigerant oils shall be as required by other articles of this code. See Articles 74, 75, 79, and 80 for storage, use, and handling other than within refrigeration systems.

EXCEPTION: Spare parts, tools, and incidental materials necessary for the safe and proper operation and maintenance of the system.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6322, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6323 Changing of refrigerant type.

Refrigerant types shall not be changed without prior notification and approval of the chief.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6323, filed 12/19/96, effective 7/1/97.]

WAC 51-34-6324 Records.

The person in charge of the premises on which a refrigeration unit or system subject to these regulations is installed or maintained shall keep a written record of refrigerant quantities brought onto and removed from the premises. Such records shall be available to the fire department.

[Statutory Authority: RCW 19.27.074. 97-01-135, § 51-34-6324, filed 12/19/96, effective 7/1/97.]

WAC 51-34-7800 Article 78—Fireworks and pyrotechnic special effects material.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-7800, filed 12/21/94, effective 6/30/95.]

WAC 51-34-7802 Section 7802—Fireworks.

7802.1 General. Storage, use and handling of fireworks shall be in accordance with Chapter 70.77 RCW and local ordinances consistent with Chapter 70.77 RCW.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-7802, filed 12/21/94, effective 6/30/95.]

WAC 51-34-7900 Article 79—Flammable and combustible liquids.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-7900, filed 12/21/94, effective 6/30/95.]

WAC 51-34-7902 Section 7902—Storage.

7902.1 General.

7902.1.1 Applicability. Storage of flammable and combustible liquids in containers, cylinders and tanks shall be in accordance with Sections 7901 and 7902.

For motor vehicle fuel-dispensing stations, see Article 52.

7902.1.2 Change of tank contents. Tanks subject to change in contents shall be in accordance with Section 7902.1.8. Prior to a change in contents, the chief is authorized to require testing of a tank.

7902.1.3 Labeling and signs.

7902.1.3.1 Smoking and open flames. Signs shall be posted in storage areas prohibiting open flames and smoking. See also Section 7901.9.

7902.1.3.2 Label or placard. Tanks over 100 gallons (378.5 L) in capacity permanently installed or mounted and used for the storage of Class I, II or III-A liquids shall bear a label or placard identifying the material therein in accordance with U.F.C. Standard 79-3.

EXCEPTIONS: 1. Tanks of 300 gallons (1135.5 L) capacity or less located on private property and used for heating and cooking fuels in single-family dwellings.
2. Tanks located underground.

7902.1.4 Sources of ignition. Smoking and open flames are prohibited in storage areas. See also Section 7901.10.

7902.1.5 Explosion control. Explosion control, equivalent protection devices or suppression systems, or a barricade shall be provided in accordance with the Building Code when Class I liquids are stored inside buildings in excess of the exempt amounts, or where explosive vapor-air mixtures could develop under normal operating conditions.

EXCEPTION: Class I-B and I-C liquids when provided with continuous ventilation at the rate set forth in Section 8003.1.8.

See also Sections 7902.5.11.7, 7902.5.12.7, 7903.2.3.4.3 and 7903.2.3.5.3.

7902.1.6 Separation from incompatible materials and accumulation of combustibles. Storage of flammable and combustible liquids shall be separated from incompatible hazardous materials in accordance with Section 8001.9.8.

Grass; weeds; combustible materials; and waste Class I, II and III-A liquids shall not be accumulated in an unsafe manner at a storage site.

7902.1.7 Abandonment and status of tanks.

7902.1.7.1 General. Tanks taken out of service as a result of a property's being abandoned or its use being changed shall be removed or abandoned in place in accordance with Section 7902.1.7.2.3 or 7902.1.7.3.3. The time schedules stipulated shall not apply.

In other cases, tanks taken out of service shall be safeguarded or removed in accordance with Section 7902.1.7.

7902.1.7.2 Underground tanks.

7902.1.7.2.1 Temporarily out of service. Underground tanks temporarily out of service shall have the fill line, gage opening, vapor return and pump connection secure against tampering. Vent lines shall remain open and be maintained in accordance with Sections 7902.1.10 and 7902.2.6.

7902.1.7.2.2 Out of service 90 days. Underground tanks not used for a period of 90 days shall be safeguarded in accordance with the following or removed in accordance with Section 7902.1.7.4:

1. Flammable or combustible liquids shall be removed from the tank,

2. All piping, including fill line, gage opening, vapor return and pump connection, shall be capped or plugged and secured from tampering, and

3. Vent lines shall remain open and be maintained in accordance with Section 7902.1.10 and 7902.2.6.

7902.1.7.2.3 Underground tanks out of service for one year. Underground tanks which have been out of service for a period of one year shall be removed from the ground in accordance with Section 7902.1.7.4 and the site shall be restored in an approved manner. When the chief determines that the removal of the tank is not necessary, abandonment in place is allowed.

7902.1.7.2.4 Tanks abandoned in place. Tanks abandoned in place shall be abandoned as follows:

1. Flammable and combustible liquids shall be removed from the tank and connected piping,

2. The suction, inlet, gage, vapor return and vapor lines shall be disconnected,

3. The tank shall be filled completely with an inert solid material approved by the chief,

4. Remaining underground piping shall be capped or plugged, and

5. A record of tank size, location and date of abandonment shall be retained.

7902.1.7.2.5 Reinstallation of underground tanks. Tanks which are to be reinstalled for flammable or combustible liquid service shall comply with all of the provisions of Article 79 and shall be tested in a manner approved by the chief.

7902.1.7.3 Aboveground tanks.

7902.1.7.3.1 Temporarily out of service. Aboveground tanks temporarily out of service shall have all connecting lines isolated from the tank and secured against tampering.

7902.1.7.3.2 Out of service 90 days. Aboveground tanks not used for a period of 90 days shall be safeguarded in accordance with Section 7902.1.7.2.2 or removed in accordance with Section 7902.1.7.4.

7902.1.7.3.3 Aboveground tanks out of service one year. Aboveground tanks which have been out of service for a period of one year shall be removed in accordance with Section 7902.1.7.4.

EXCEPTION: Tanks located at refineries, bulk plants and terminals that are in operation.

7902.1.7.4 Removing tanks.

7902.1.7.4.1 General. Removal of aboveground and underground tanks shall be in accordance with all of the following:

1. Flammable and combustible liquids shall be removed from the tank and connecting piping,

2. Piping at tank openings which is not to be used further shall be disconnected,

3. Piping shall be removed from the ground,

EXCEPTION: Piping is allowed to be abandoned in place when the chief determines that removal is not practical. Abandoned piping shall be capped and safeguarded as required by the chief.

4. Tank openings shall be capped or plugged, leaving a 1/8-inch to 1/4-inch-diameter (3.2 mm to 6.4 mm) opening for pressure equalization, and

5. Tanks shall be purged of vapor and inerted prior to removal.

7902.1.7.4.2 Disposal. Tanks shall be disposed of in accordance with federal, state and local regulations.

7902.1.8 Design, construction and general installation requirements for tanks, containers and equipment.

7902.1.8.1 Portable tanks, containers and equipment.

7902.1.8.1.1 General. Portable tanks, containers and equipment used or intended to be used for the storage of flammable or combustible liquids shall be of an approved type. Containers and portable tanks shall be designed and constructed in accordance with nationally recognized standards. See Article 90, Standards u.1.2 and u.1.12 and U.F.C. Standard 79-5. The capacity of individual containers and portable tanks for liquids shall be in accordance with Table 7902.1-A.

EXCEPTION: Medicines, beverages, foodstuffs and cosmetics when packaged according to commonly accepted practices for retail sales.

7902.1.8.1.2 Use of tank cars and tank vehicles as storage tanks. Tank cars and tank vehicles shall not be used as storage tanks.

7902.1.8.1.3 Plastic containers. Plastic containers shall not be used for storage of Class I or II liquids unless such containers are listed and approved for such storage or the containers are stored in liquid storage rooms or liquid storage warehouses. See Sections 7902.5.11 and 7902.5.12.

See also Section 7902.5.10.2.2 for additional limitations.

7902.1.8.2 Tanks.

7902.1.8.2.1 General. The design, fabrication and construction of tanks shall be in accordance with recognized good engineering practice and nationally recognized standards. See Article 90, Standards a.3.1, a.3.2, a.3.3, a.3.4, a.3.5, a.4.8, u.1.3, u.1.5, u.1.7 and u.1.13.

7902.1.8.2.2 Use of tanks cars and tank vehicles as storage tanks. Tank cars and tank vehicles shall not be used as storage tanks.

7902.1.8.2.3 Pressure limitations for tanks. Tanks shall be designed for the pressures to which they are subjected as follows:

1. Atmospheric tanks shall not exceed operating pressures of 1 psig (6.89 kPa) and shall not exceed 2.5 psig (17.2 kPa) under emergency venting conditions. Such tanks shall not be used for the storage of a liquid at a temperature at or above its boiling point,

2. Low-pressure tanks and pressure vessels are allowed to be used as atmospheric tanks,

3. Pressure vessels are allowed to be used as low-pressure tanks,

4. The normal operating pressure of any tank or pressure vessel shall not exceed the design pressure, and

5. Unless otherwise approved by the chief, fired and unfired pressure vessels shall be designed and constructed in accordance with nationally recognized standards. See Article 90, Standard a.3.4 and a.5.1.

7902.1.8.2.4 Locations subject to flooding. Where a tank is located in an area that is subject to flooding, uplift protection shall be provided. See Appendix II-B.

7902.1.8.2.5 Acceptance testing. Prior to being put into service, tanks shall be tested in accordance with nationally recognized standards.

7902.1.8.2.6 Product compatibility. Tank construction materials shall be compatible with the liquid to be stored. The chief is authorized to require that evidence be submitted to substantiate that the properties of the liquid are compatible with the tank.

7902.1.8.2.7 Use of combustible materials in tank construction. Tanks constructed of combustible materials shall be subject to the approval of the chief and limited to:

1. Installation underground,

2. Case where required by the properties of the liquid stored,

3. Storage of Class III-B liquids aboveground in areas not potentially exposed to a spill or leak of Class I or II liquid, or

4. Storage of Class III-B liquids inside a building protected by an approved automatic fire-extinguishing system.

7902.1.8.2.8 Use of concrete in tank construction. Unlined concrete tanks are allowed for storing liquids having a gravity of 40 degrees API or heavier. Concrete tanks with special linings are allowed for other services, provided the design is in accordance with approved engineering practices. See also Section 7902.1.8.2.11.

7902.1.8.2.9 Tank linings. Tanks are allowed to have combustible or noncombustible linings.

7902.1.8.2.10 Tanks containing liquids with high specific gravity and low temperature liquids. Special engineering consideration shall be used if the specific gravity of the liquid to be stored exceeds that of water or if the tank is designed to contain liquid temperature below 0°F. (-17.8°C.).

7902.1.8.2.11 Existing oil storage reservoirs. Existing oil storage reservoirs with a concrete lining and with a combustible roof covering and built prior to the adoption of requirements set forth in Section 7902.1.8 are allowed to be continued for the storage of petroleum products with a flash point in excess of 150°F. (65.6°C.).

7902.1.9 Seismic design. In areas subject to earthquakes, the tank supports and connections shall be designed to resist damage as a result of seismic activity in accordance with the Building Code.

7902.1.10 Tank vents for normal venting.

7902.1.10.1 General. Tank vents for normal venting shall be installed and maintained in accordance with Section 7902.1.10. See Section 7902.2.6 for emergency vents.

7902.1.10.2 Vent lines. Vent lines from tanks shall not be used for purposes other than venting unless approved by the chief.

7902.1.10.3 Vent line flame arresters and venting devices. Vent line flame arresters and venting devices shall be installed in accordance with their listings.

Use of flame arresters in piping systems shall be in accordance with nationally recognized standards. See Article 90, Standard a.3.17.

7902.1.10.4 Vent pipe outlets. Vent pipe outlets for tanks storing Class I, II, or III-A liquids shall be located such that

the vapors are released at a safe point outside of buildings and not less than 12 feet (3658 mm) above the adjacent ground level. Vapors shall be discharged upward or horizontally away from closely adjacent walls to assist in vapor dispersion. Vent outlets shall be located such that flammable vapors will not be trapped by eaves or other obstructions and shall be at least 5 feet (1524 mm) from building openings or property lines of properties that can be built on.

7902.1.10.5 Installation of vent piping. Vent piping shall be constructed in accordance with Section 7901.11. Vent pipes shall be installed such that they will drain toward the tank without sags or traps in which liquid can collect. Vent pipes shall be installed in such a manner as to not be subject to physical damage or vibration.

7902.1.10.6 Manifolding. Tank vent piping shall not be manifolded unless required for special purposes such as vapor recovery, vapor conservation or air pollution control. Manifolded vent pipes shall be adequately sized to prevent system pressure limits from being exceeded when manifolded tanks are subject to the same fire exposure.

Vent piping for tanks storing Class I liquids shall not be manifolded with vent piping for tanks storing Class II or III liquids unless positive means are provided to prevent the vapors from Class I liquids from entering tanks storing Class II or III liquids, to prevent contamination and possible change in classification of the less volatile liquid.

7902.1.10.7 Vent sizing. Tank venting systems shall be provided with sufficient capacity to prevent blowback of vapor or liquid at the fill opening while the tank is being filled. Vent pipes shall not be less than 1 ¼-inch (31.8 mm) nominal inside diameter. The capacity of the vent shall be based on the filling or withdrawal rate, whichever is greater, and the vent line length. Unrestricted vent piping sized in accordance with Table 7902.1-B is acceptable to prevent back-pressure development in tanks from exceeding 2.5 psig (17.2 kPa). Where tank-venting devices are installed in vent lines, their flow capacities shall be determined in accordance with nationally recognized standards. See Article 90, Standard a.3.11.

7902.1.10.8 Additional requirements for aboveground tanks.

7902.1.10.8.1 General. Atmospheric storage tanks shall be adequately vented to prevent the development of vacuum or pressure sufficient to distort the roof of a cone roof tank or exceed the design pressure in the case of other atmospheric tanks as a result of filling or emptying and atmospheric temperature changes.

Normal vents shall be sized in accordance with nationally recognized engineering standards or shall be at least as large as the filling or withdrawal connection, whichever is larger, but not less than 1 1/4-inch (31.8 mm) nominal inside diameter. See Article 90, Standard a.3.11.

If a tank or pressure vessel has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow.

7902.1.10.8.2 Low-pressure tanks and pressure vessels. Low-pressure tanks and pressure vessels shall be adequately vented to prevent pressure or vacuum from exceeding the design pressure of the tank or vessel as a result of filling or emptying and atmospheric temperature changes. Protection shall also be provided to prevent over pressure from pumps discharging into the tank or vessel when the pump discharge pressure can exceed the design pressure of the tank or vessel.

7902.1.10.8.3 Vent outlets and drains. For tanks designed to vent at pressures greater than 2.5 psig (17.2 kPa), vent outlets and drains shall discharge in a manner which prevents localized overheating of or flame impingement on any part of the tank.

7902.1.10.8.4 Tanks and pressure vessels containing Class I liquids. Tanks and pressure vessels storing Class I-A liquids shall be equipped with venting devices which shall normally be closed, except when venting under pressure or vacuum conditions. Tanks and pressure vessels storing Class I-B or I-C liquids shall be equipped with venting devices which shall be normally closed except when venting under pressure or vacuum conditions, or with listed flame arresters.

EXCEPTIONS:
1. Tanks of 3,000-barrel (476 960 L) capacity or less containing crude petroleum in crude producing areas are allowed to have open vents.
2. Outside aboveground atmospheric tanks under 1,000-gallon (3785 L) capacity are allowed to have open vents.
3. Flame arresters or venting devices with integral flame arresters need not be provided for Class I-B and I-C liquids where conditions are such that their use could, in case of obstruction, result in tank damage.

Liquid properties justifying the omission of such devices include, but are not limited to, condensation, corrosiveness, crystallization, polymerization, freezing or plugging. When any of these conditions exist, consideration shall be given to heating, use of devices employing special materials of construction, the use of liquid seals or inerting in accordance with nationally recognized standards for explosion-prevention systems. See Section 101.3.

4. Vent pipes 2 inches (50.8 mm) or less in nominal inside diameter and longer than 10 feet (3048 mm) are allowed to have open vents.

5. Tanks storing gasoline are allowed to have open vents provided the vent pipes do not exceed a 3-inch (76.2 mm) nominal inside diameter.

7902.1.10.9 Additional requirements for underground tanks.

7902.1.10.9.1 General. Tank-venting systems located on underground tanks shall be in accordance with Section 7902.1.10.9.

7902.1.10.9.2 Vent pipes, outlets and devices. Vent pipes shall not be obstructed by devices provided for vapor recovery or other purposes unless the tank and associated piping and equipment are otherwise protected to limit back-pressure development to less than the maximum working pressure of the tank and equipment by providing pressure/vacuum vents, rupture discs or other tank-venting devices installed in the tank vent lines. Vent outlets and

devices shall be protected to minimize the possibility of blockage from weather, snow, dirt or insect nests.

7902.1.10.9.3 Tanks containing Class I liquids. Tanks containing Class I-A liquids shall be equipped with pressure/vacuum venting devices with integral flame arresters which shall be normally closed except when venting under pressure or vacuum conditions. Tanks storing Class I-B or I-C liquids shall be equipped with pressure/vacuum venting devices or with listed flame arresters.

EXCEPTIONS: 1. Vent pipes 2 inches (50.8 mm) or less in nominal inside diameter and longer than 10 feet (3048 mm) shall not be obstructed by devices that will reduce their capacity and, thus, cause extensive back pressure.
2. Tanks storing gasoline are not required to have pressure/vacuum venting devices except as required for excessive back pressure, or flame arresters, provided the vent does not exceed a 3-inch (76.2 mm) nominal inside diameter.

7902.1.10.9.4 Condensate tanks. Condensate tanks, if utilized, shall be installed and maintained in a manner which will preclude the blocking of the vapor-return piping by liquid. Condensate tanks shall be located such that they will not be subjected to physical damage. The vent pipe shall enter the tank through the top of the tank. The lower end of vent pipes shall not extend into the tank more than 1 inch (25.4 mm).

7902.1.10.9.5 Manifolding. Manifolded vent pipes shall be adequately sized to prevent system pressure limits from being exceeded when manifolded tanks are filled simultaneously. Float-type check valves installed in tank openings connected to manifold vent piping to prevent product contamination are allowed, provided that the static head imposed at the bottom of the tank will not exceed 10 psig (68.9 kPa) if the fill or vent pipe is filled with liquid when the valves are closed.

EXCEPTION: For motor vehicle fuel-dispensing stations, the capacity of manifolded vent piping shall be sufficient to discharge vapors generated when two manifolded tanks are simultaneously filled.

7902.1.11 Tank vents for emergency venting.

7902.1.11.1 Stationary aboveground tanks. Stationary aboveground tanks shall be provided with emergency venting. For requirements see Section 7902.2.6.

7902.1.11.2 Portable tanks. Portable tanks shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire-exposure conditions to 10 psig (68.9 kPa) or 30 percent of the bursting pressure of the tank, whichever is greater. The total venting capacity shall not be less than that specified in Sections 7902.2.6.3.1 and 7902.2.6.3.3. At least one pressure-actuated vent having a minimum capacity of 6,000 cubic feet (169.9 m^3) of free air per hour at 14.7 psia (101.3 kPa) and 60°F. (15.6°C.) shall be used. It shall be set to open at not less than 5 psig (34.5 kPa). If fusible vents are used, they shall be actuated by elements that operate at a temperature not exceeding 300°F. (148.9°C.). When used for paints, drying oils and similar materials where plugging of the pressure-actuated vent can occur, fusible vents or vents of the type that soften to failure at a maximum of 300°F. (148.9°C.) under fire exposure are allowed for the entire emergency venting requirement.

7902.1.12 Tank openings other than vents.

7902.1.12.1 Inside buildings.

7902.1.12.1.1 General. Connections for tank openings shall be liquid tight. Openings to tanks shall be located outside of buildings at a location free from sources of ignition and not less than 10 feet (3048 mm) away from building openings or of lines of property that can be built on. Such openings shall be provided with a liquid-tight cap which shall be closed when not in use and shall be properly identified.

For top-loaded tanks, a metallic fill pipe shall be designed and installed to minimize the generation of static electricity by terminating the pipe within 6 inches (152.4 mm) of the bottom of the tank, and it shall be installed in a manner which avoids excessive vibration.

7902.1.12.1.2 Vapor recovery. Tank openings provided for the purposes of vapor recovery shall be protected against possible vapor release by means of a spring-loaded check valve or dry-break connections, or other approved device, unless the opening is pipe connected to a vapor-processing system. Openings designed for combined fill and vapor recovery shall also be protected against vapor release unless connection of the liquid delivery line to the fill pipe simultaneously connects the vapor-recovery line. Connections shall be vapor tight.

7902.1.12.1.3 Valves for tank connections. Connections to tanks inside of buildings through which liquid can normally flow shall be provided with an internal or an external valve located as close as practical to the shell of the tank.

For connections to tanks containing Class I or II liquids inside of buildings, such valve or an additional adjacent valve shall be either:

1. Normally closed and remotely activated,

2. Automatic-closing and heat-activated, or

3. As an alternate to valving an approved device on each liquid-transfer connection below the liquid level, except for connections used for emergency disposal, to provide for quick cutoff of flow in the event of fire in the vicinity of the tank is allowed.

7902.1.12.1.4 Overflow protection. Tanks storing Class I, II and III-A liquids inside buildings shall be equipped with a device or other means to prevent overflow into the building. Suitable devices include, but are not limited to, a float valve, a preset meter on the fill line, a valve actuated by the weight of the tank contents, a low head pump which is incapable of producing overflow or a liquid-tight overflow pipe at least one pipe size larger than the fill pipe discharging by gravity back to the outside source of liquid or to an approved location.

7902.1.12.1.5 Piping, valves and fittings. Connections, fittings and other appurtenances shall be installed in accordance with Section 7901.11.

7902.1.12.1.6 Manual gaging. Openings for manual gaging, if independent of the fill pipe, shall be provided with

a liquid-tight cap or cover. Covers shall be kept closed when not gaging. If inside a building, such openings shall be protected against liquid overflow and possible vapor release by means of a spring-loaded check valve or other approved device.

7902.1.12.2 Underground.

7902.1.12.2.1 Piping, valves and fittings. Connections, fittings and other appurtenances shall be installed in accordance with Section 7901.11.

7902.1.12.2.2 Manual gaging. Openings for manual gaging, if independent of the fill pipe, shall be provided with a liquid-tight cap or cover. Covers shall be kept closed when not gaging. If inside a building, such openings shall be protected against liquid overflow and possible vapor release by means of a spring-loaded check valve or other approved device.

7902.1.12.2.3 Fill pipe and discharge lines. Fill pipe and discharge lines shall enter tanks only through the top. Fill lines shall be sloped toward the tank. Underground tanks for Class I liquids having a capacity of more than 1,000 gallons (3785 L) shall be equipped with a tight fill device for connecting the fill hose to the tank.

Overfill protection shall be provided in accordance with Section 7902.6.5.

For Class I liquids other than crude oil, gasoline and asphalt, the fill pipe shall be designed and installed in a manner which will minimize the possibility of generating static electricity by terminating within 6 inches (152.4 mm) of the bottom of the tank.

7902.1.12.2.4 Location of connections that are made or broken. Filling, withdrawal and vapor-recovery connections for Class I, II and III-A liquids which are made and broken shall be located outside of buildings at a location away from sources of ignition and not less than 5 feet (1524 mm) away from building openings. Such connections shall be closed and liquid tight when not in use and shall be properly identified.

7902.1.12.2.5 Protection against vapor release. Tank openings provided for purposes of vapor recovery shall be protected against possible vapor release by means of a spring-loaded check valve or drybreak connection, or other approved device, unless the opening is pipe-connected to a vapor-processing system. Openings designed for combined fill and vapor recovery shall also be protected against vapor release unless connection of the liquid delivery line to the fill pipe simultaneously connects the vapor-recovery line. Connections shall be vapor tight.

7902.1.12.3 Exterior aboveground. Openings for manual gaging on tanks storing Class I liquids shall be provided with a vapor-tight cap or cover. Such covers shall be closed when not gaging. See also Section 7902.2.7.

7902.1.13 Supports, foundations and anchorage.

7902.1.13.1 General. Supports, foundations and anchorage for aboveground tanks shall be in accordance with Section 7902.1.13.

7902.1.13.2 Tanks at grade. Tanks shall rest on the ground or on foundations made of concrete, masonry, piling or steel. Tank foundations shall be designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation.

7902.1.13.3 Tanks above grade. Tanks shall be securely supported. Supports for tanks storing Class I, II or III-A liquids shall be of concrete, masonry or protected steel. Single wood timber supports, not cribbing, laid horizontally, are allowed for outside aboveground tanks when the bottom of the tank is not more than 12 inches (304.8 mm) above grade.

7902.1.13.4 Fire protection of steel supports. Steel supports or piling for aboveground tanks storing Class I, II or III-A liquids shall have a fire-resistance rating of not less than two hours, except that solid web steel saddles need not be protected if the bottom of the tank is less than 12 inches (304.8 mm) above grade. At the discretion of the chief, water-spray protection in accordance with U.F.C. Standard 79-2 or the Building Code or equivalent may be used. See U.B.C. Standard 9-1.

7902.1.13.5 Design of supports. The design of the supporting structure for tanks shall be in accordance with well-established engineering principles of mechanics and shall be in accordance with the Building Code.

7902.1.14 Stairs, platforms and walkways. Stairs, platforms and walkways shall be of noncombustible construction and shall be designed and constructed in accordance with the Building Code.

7902.2 Stationary Aboveground Tanks Outside of Buildings.

7902.2.1 General. Stationary aboveground tanks outside of buildings shall be in accordance with Sections 7902.1 and 7902.2.

7902.2.2 Tank locations.

7902.2.2.1 Locations where aboveground tanks are prohibited. Storage of Class I and II liquids in aboveground tanks outside of buildings is prohibited within the limits established by law as the limits of districts in which such storage is prohibited. (See sample adoption ordinance, Section 4.)

7902.2.2.2 Location of tanks with pressures 2.5 psig (17.2 kPa) or less. Aboveground tanks operating at pressures not exceeding 2.5 psig (17.2 kPa) for storage of Class I, II or III-A liquids, which are designed with a weak roof-to-shell seam or equipped with emergency venting devices limiting pressures to 2.5 psig (17.2 kPa), shall be located in accordance with Table 7902.2-A.

EXCEPTIONS:
1. Vertical tanks having a weak roof-to-shell seam and storing Class III-A liquids are allowed to be located at one half the distances specified in Table 7902.2-A, provided that the tanks are not within a diked area or drainage path for a tank storing Class I or II liquids.
2. Liquids with boilover characteristics and unstable liquids. See Sections 7902.2.2.4 and 7902.2.2.5.

7902.2.2.3 Location of tanks with pressures exceeding 2.5 psig (17.2 kPa). Aboveground tanks for the storage of Class I, II or III-A liquids operating at pressures exceeding 2.5

psig (17.2 kPa) or equipped with emergency venting allowing pressures to exceed 2.5 psig (17.2 kPa) shall be located in accordance with Table 7902.2-B.

EXCEPTION: Liquids with boilover characteristics and unstable liquids. See Sections 7902.2.2.4 and 7902.2.2.5.

7902.2.2.4 Location of tanks for boilover liquids. Aboveground tanks for storage of liquids with boilover characteristics shall be located in accordance with Table 7902.2-C.

7902.2.2.5 Location of tanks for unstable liquids. Aboveground tanks for the storage of unstable liquids shall be located in accordance with Table 7902.2-D.

7902.2.2.6 Location of tanks for Class III-B liquids. Aboveground tanks for the storage of Class III-B liquids, excluding unstable liquids, shall be located in accordance with Table 7902.2-E, except when located within a diked area or drainage path for a tank or tanks storing Class I or II liquids. When a Class III-B liquid storage tank is within the diked area or drainage path for a Class I or II liquid, distances required by Section 7902.2.2.2 shall apply.

7902.2.2.7 Reduction of separation distances to adjacent property. Where two tank properties of diverse ownership have a common boundary, the chief is authorized to, with the written consent of the owners of the two properties, apply the distances in Sections 7902.2.2.2 through 7902.2.2.6 assuming a single property.

7902.2.3 Separation and orientation of tanks.

7902.2.3.1 Separation between adjacent tanks containing stable liquids. The separation between tanks containing stable liquids shall be in accordance with Table 7902.2-G. When tanks are in a diked area containing Class I or II liquids, or in the drainage path of Class I or II liquids, and are compacted in three or more rows or in an irregular pattern, the chief is authorized to require greater separation than that specified in Table 7902.2-G or other means to make tanks in the interior of the pattern accessible for firefighting purposes.

7902.2.3.2 Separation between adjacent tanks containing unstable liquids. The separation between tanks containing unstable liquids shall not be less than one half the sum of their diameters.

7902.2.3.3 Separation between adjacent tanks containing flammable or combustible liquids and LP-gas. The minimum horizontal separation between an LP-gas container and a Class I, II or III-A liquid storage tank shall be 20 feet (6096 mm) except in the case of Class I, II or III-A liquid tanks operating at pressures exceeding 2.5 psig (17.2 kPa) or equipped with emergency venting allowing pressures to exceed 2.5 psig (17.2 kPa), in which case the provisions of Section 7902.2.3.1 shall apply.

Suitable means shall be provided to prevent the accumulation of Class I, II or III-A liquids under adjacent LP-gas containers such as by dikes, diversion curbs or grading. When flammable or combustible liquid storage tanks are within a diked area, the LP-gas containers shall be outside the diked area and at least 10 feet (3048 mm) away from the center line of the wall of the diked area.

EXCEPTIONS: 1. Liquefied petroleum gas containers of 125-gallons (473 L) or less capacity installed adjacent to fuel-oil supply tanks of 660-gallons (2498 L) or less capacity.
2. Horizontal separation is not required between aboveground LP-gas containers and underground flammable and combustible liquid tanks.

7902.2.3.4 Orientation of horizontal pressure tanks. Where end failure of horizontal pressure tanks and vessels can expose property, the tank shall be placed with the longitudinal axis parallel to the nearest important exposure.

7902.2.4 Foam fire protection.

7902.2.4.1 Required systems. When required by the chief, foam fire protection shall be provided for aboveground tanks, other than pressure tanks operating at or above 1 psig (6.89 kPa), when such tank, or group of tanks spaced less than 50 feet (15 240 mm) apart measured shell to shell, has a liquid surface area in excess of 1,500 square feet (139.4 m^2), and is

1. Used for the storage of Class I or II liquids,

2. Used for storage of crude oil,

3. Used for in-process products and is located within 100 feet (30 480 mm) of a fired still, heater, related fractioning or processing apparatus or similar device at a processing plant or petroleum refinery as herein defined, or

4. Considered by the chief as presenting an unusual exposure hazard because of topographical conditions; nature of occupancy, proximity on the same or adjoining property, and height and character of liquids to be stored; and degree of private fire protection to be provided and facilities of the fire department to cope with flammable liquid fires.

7902.2.4.2 Installation. Where foam fire protection is required, installation shall be in accordance with U.F.C. Standard 79-1.

7902.2.4.3 Foam storage. Where foam fire protection is required, foam-producing materials shall be stored on the premises.

EXCEPTIONS: Storage of foam-producing materials off the premises is allowed as follows:
1. Such materials stored off the premises shall be of the proper type suitable for use with the equipment at the installation where required,
2. Such materials shall be immediately available at the storage location at all times,
3. Adequate loading and transportation facilities shall be provided,
4. The time required to deliver such materials to the required location in the event of fire shall not exceed two hours, and
5. At the time of a fire, these off-premises supplies shall be accumulated in sufficient quantities before placing the equipment in operation to ensure foam production at an adequate rate without interruption until extinguishment is accomplished.

7902.2.5 Inerting of tanks with boilover liquids. Liquids with boilover characteristics shall not be stored in fixed roof tanks larger than 150 feet (45 720 mm) in diameter unless an approved inerting system is provided on the tank.

7902.2.6 Emergency relief venting for stationary tanks.

7902.2.6.1 General. Stationary tanks shall be equipped with adequate additional venting that will relieve excessive internal pressure caused by exposure to fires.

EXCEPTION: Tanks larger than 12,000-gallon (45 420 L) capacity storing Class III-B liquids and not within the diked area or the drainage path of Class I or II liquids do not require emergency relief venting.

7902.2.6.2 Type of venting device. Aboveground storage tanks shall be provided with construction or devices that will relieve excessive internal pressure caused by exposure fires.

In a vertical tank, construction methods such as floating roofs, lifter roofs, weak roof-to-shell seams or other approved pressure-relieving construction are allowed as methods providing emergency relief venting. Weak roof-to-shell seams shall be constructed to fail before any other seam.

Devices such as self-closing manhole covers, covers using long bolts that allow the cover to lift under internal pressure, and an additional or larger relief valve or valves are allowed for emergency relief venting. Such devices shall be approved relief- or pressure/vacuum-venting devices or other devices approved by the chief.

7902.2.6.3 Venting sizing.

7902.2.6.3.1 General. Where emergency relief venting is provided solely by pressure-relieving devices, the total venting capacity of both normal and emergency vents shall be enough to prevent rupture of the shell or bottom of the tank, if vertical, or of the shell or heads, if horizontal. If unstable liquids are stored, the effects of heat or gas resulting from polymerization, decomposition, condensation or self-reactivity shall be taken into account.

The total capacity of both normal and emergency venting devices shall not be less than that derived from Table 7902.2-H, except as provided in Sections 7902.2.6.3.3 and 7902.2.6.3.4. The wetted area of the tank shall be calculated on the basis of 55 percent of the total exposed area of a sphere or spheroid, 75 percent of the total exposed area of a horizontal tank and the first 30 feet (9144 mm) above grade of the exposed shell area of a vertical tank.

See Appendix VI-B for the square footage of typical tank sizes.

7902.2.6.3.2 Tanks and storage vessels over 1 psig (6.89 kPa). For tanks and storage vessels designed for pressures over 1 psig (6.89 kPa), the total rate of venting shall be determined in accordance with Table 7902.2-H, except that when the exposed wetted area of the surface is greater than 2,800 square feet (260.1 m²), the total rate of venting shall be in accordance with Table 7902.2-I or calculated by the following formula:

$$CFH = 1{,}107\ A^{0.82}$$

For SI: $$CMH = 220\ A^{0.82}$$

WHERE:

CFH = venting requirement, in cubic feet of free air per hour (CMH = m³/hr).

A = exposed wetted surface, in square feet (m²).

The foregoing formula is based on $Q = 21{,}000\ A^{0.82}$ (For SI: $Q = 43{,}198\ A^{0.82}$).

7902.2.6.3.3 Emergency relief vents. The total emergency relief venting capacity for a specific stable liquid can be determined by the following formula:

$$CFH = \frac{1{,}337\ V}{L\sqrt{M}}$$

For SI: $$CMH = \frac{743.4\ V}{L\sqrt{M}}$$

WHERE:

CFH = venting requirement, in cubic feet of free air per hour (CMH = m³/hr).

V = cubic feet (m³) of free air per hour from Table 7902.2-H.

L = latent heat of vaporization of specific liquid, in Btus per pound (cal/g).

M = molecular weight of specific liquids.

7902.2.6.3.4 Reductions in required venting for stable liquids. For tanks containing stable liquids, a reduction in the required airflow rate in Sections 7902.2.6.3.1 and 7902.2.6.3.3 is allowed. Such reduction shall be calculated by multiplying the required airflow rate in Sections 7902.2.6.3.1 or 7902.2.6.3.3 by the appropriate factor listed in the following schedule when protection is provided as indicated. Only one factor can be used for any one tank.

1. 0.5 For drainage in accordance with requirements for remote impounding in Section 7902.2.8.2 for tanks over 200 square feet (18.6 m²) of wetted area.

2. 0.3 For water spray in accordance with U.F.C. Standard 79-2 and drainage in accordance with requirements for remote impounding in Section 7902.2.8.2.

3. 0.3 For insulation in accordance with the following:

3.1 Remain in place under fire-exposure conditions,

3.2 Withstand dislodgment when subjected to hose stream impingement during fire exposure, and

EXCEPTION: The requirement may be waived by the chief where use of solid hose streams is not contemplated or would not be practical.

3.3 Maintain a maximum conductance value of 4.0 Btus per hour per square foot per degree Fahrenheit [81.8 kJ/(hr x m² x °C.)] when the outer insulation jacket or cover is at a temperature of 1,660°F. (904°C.) and when the mean temperature of the insulation is 1,000°F. (538°C.).

4. 0.15 For water spray with insulation in accordance with U.F.C. Standard 79-2 and drainage in accordance with requirements for remote impounding in Section 7902.2.8.2.

7902.2.6.4 Venting device capacity.

7902.2.6.4.1 Identification. Commercial tank venting devices shall bear a stamp indicating the opening pressure, the pressure at which the valve reaches the full-open position and the flow capacity at the latter pressure. If the start-to-open pressure is less than 2.5 psig (17.2 kPa) and the pressure at full-open position is greater than 2.5 psig (17.2 kPa), the flow capacity at 2.5 psig (17.2 kPa) shall also be stamped on the venting device. The flow capacity shall be expressed in cubic feet per hour of air at 60°F. and 14.7 psia (m³ of air/hr at 15.6°C. and 101.3 kPa).

7902.2.6.4.2 Determination of capacity. The flow capacity of tank venting devices under 8 inches (203 mm) in nominal pipe size shall be determined by actual test of each type and size of vent. These flow tests shall be conducted by a qualified impartial outside agency or by the manufacturer

when certified by a qualified impartial observer. Calculation of the flow capacity of tank venting devices 8 inches (203 mm) nominal pipe size and larger, including manhole covers with long bolts or equivalent, is allowed provided that the opening pressure is actually measured, the rating pressure and corresponding free orifice area are stated, the work "calculated" appears on the nameplate, and the computation is based on a flow coefficient of 0.5 applied to the rated orifice area.

Calculations shall be performed using the following formula:

$$CFH = 1.667 C_f A \sqrt{P_t - P_a}$$

For SI:

$$CMH = 0.1467 C_f A \sqrt{P_t - P_a}$$

WHERE:

CFH = venting requirement in cubic feet of free air per hour (CMH = m³/hr).
C_f = 0.5 (the flow coefficient)
A = the orifice area in square inches (mm²).
P_t = the absolute pressure inside the tank in inches of water (kPa).
P_a = the absolute atmospheric pressure outside the tank in inches of water (kPa).

7902.2.6.5 Termination of vent outlets.

7902.2.6.5.1 General. Emergency vents shall not discharge inside a building.

7902.2.6.5.2 Tanks with pressures exceeding 2.5 psig (17.2 kPa). The outlets of vents and vent drains on tanks equipped with emergency venting that allows pressures to exceed 2.5 psig (17.2 kPa) shall be arranged to discharge in a manner which prevents localized overheating of, or flame impingement on, any part of the tank if vapors from such vents are ignited.

7902.2.7 Tank openings other than vents.

7902.2.7.1 General. Connections to aboveground tanks through which liquid can normally flow shall be provided with internal or external valves located as close as practical to the shell of the tank. See also Section 7902.1.12.

Connections below the liquid level through which liquid does not normally flow shall be provided with a liquid-tight closure, such as a valve, plug or blind, or a combination of these.

7902.2.7.2 Fill pipe openings. For top-loaded tanks, metallic fill pipes shall be designed and installed to minimize the generation of static electricity by terminating the pipe within 6 inches (152.4 mm) of the bottom of the tank and shall be installed to avoid excessive vibration.

For Class I-B and I-C liquids, other than crude oils and asphalts, fill pipes shall be designed and installed in a manner which minimizes the possibility of generating static electricity.

Filling and withdrawal connections for Class I, II and III-A liquids which are made and broken shall be located outside of buildings at a location away from sources of ignition and not less than 5 feet (1524 mm) away from building openings. Such connections for any liquid shall be closed, liquid tight when not in use and properly identified.

7902.2.7.3 Openings for vapor recovery. Vapor-recovery systems shall be in accordance with Section 5202.12.

7902.2.7.4 Piping, valves and fittings. Connections, fittings or other appurtenances shall be installed in accordance with Section 7901.11.

7902.2.8 Drainage control and diking.

7902.2.8.1 General. The area surrounding a tank or group of tanks shall be provided with drainage control or shall be diked to prevent accidental discharge of liquid from endangering adjacent tanks, adjoining property or reaching waterways.

EXCEPTION: The chief is authorized to alter or waive these requirements when determined by the chief that such tank or group of tanks does not constitute a hazard to other tanks, waterways or adjoining property, after consideration of special features such as topographical conditions, nature of occupancy and proximity to buildings on the same or adjacent property, capacity and construction of proposed tanks and character of liquids to be stored, and nature and quantity of private and public fire protection provided.

7902.2.8.2 Drainage system. Where protection of adjacent tanks, adjoining property or waterways is by means of a natural or constructed drainage system, such system shall comply with the following:

1. Drainage shall be provided at a slope of not less than 1 percent away from the tank toward an impounding basin or an approved means of disposal. This termination area and the route of the drainage system shall be so located that a fire occurring in the drainage system will not endanger pumps, manifolds, control valves, electrical equipment, public utilities, fire-protection equipment, tanks, adjoining property or fire apparatus access roads, and

2. Impounding basins and approved means of disposal shall be designed to retain a spill from the largest capacity tank draining into a basin plus the design discharge from fire protection systems including monitor nozzles, as specified in U.F.C. Standard 79-1, Chapter 3, which flow into a basin. Impounding basins and the route of a drainage system shall be located such that a fire occurring in a drainage system will not endanger pumps, manifolds, control valves, electrical equipment, public utilities, fire-protection equipment, tanks, adjoining properties or fire apparatus access roads.

7902.2.8.3 Diked areas.

7902.2.8.3.1 General. Where protection of adjacent tanks, adjoining property or waterways is accomplished by retaining the liquid around the tank by means of a diked area, such diked areas shall comply with Section 7902.2.8.3.

7902.2.8.3.2 Volumetric capacity. The volumetric capacity of the diked area shall not be less than the greatest amount of liquid that can be released from the largest tank within the diked area. The capacity of the diked area enclosing more than one tank shall be calculated by deducting the volume of the tanks other than the largest tank below the height of the dike.

7902.2.8.3.3 Walls. Walls of the diked area shall be of earth, steel, concrete or solid masonry designed to be liquid tight and to withstand a full hydrostatic head. Earthen walls 3 feet (914.4 mm) or more in height shall have a flat section at the top not less than 2 feet (609.6 mm) wide. The slope shall be consistent with the angle of repose of the material of which the walls are constructed.

The walls of the diked area shall be restricted to an average height of 6 feet (1828.8 mm) above the interior grade, except when dikes are higher than an average of 6 feet (1828.8 mm) above interior grade, provisions shall be made for normal and necessary emergency access to tanks, valves and other equipment and safe egress from the diked enclosure, as follows:

1. Where the average height of the dike containing Class I liquids is over 12 feet (3657.6 mm) measured from interior grade or where the distance between a tank and the top inside edge of the dike wall is less than the height of the dike wall, provisions shall be made for normal operation of valves and for access to tank roofs without entering below the top of the dike. These provisions are allowed to be met through the use of remotely operated valves, elevated walkways or similar arrangements,

2. Piping passing through dike walls shall be designed to prevent excessive stresses as a result of settlement or fire exposure, and

3. The minimum distance between tanks and the toe of the interior dike walls shall be 5 feet (1524 mm), and diked areas containing two or more tanks shall comply with Section 7902.2.8.3.4.

7902.2.8.3.4 Diked areas containing two or more tanks. Diked areas containing two or more tanks shall be subdivided by drainage channels leading to an impounding basin or by intermediate curbs or spill dikes in order to prevent spills from endangering adjacent tanks within the diked area. Intermediate curbs and spill dikes shall not be less than 18 inches (457.2 mm) in height.

7902.2.8.3.5 Protection of piping from exposure fires. Piping shall not pass through adjacent diked areas or impounding basins, unless provided with a sealed sleeve or otherwise protected from exposure to fire.

7902.2.8.3.6 Removing water from diked area. Provision shall be made for draining or removing excess water from a drainage system or diked area. Such drains shall not discharge to adjoining property, natural water courses, public sewers or public drainage channels unless the drain is designed to prevent the release of flammable or combustible liquids. A valve operable from outside the dike shall be provided in the dike system and shall normally be kept closed. Control of drainage shall be accessible under fire conditions.

7902.2.8.3.7 Combustible materials in diked areas. Diked areas shall be kept free of combustible materials, drums and barrels.

7902.2.8.3.8 Equipment, controls and piping in diked areas. Pumps, manifolds, and fire-protection equipment or controls shall not be located within diked areas or drainage basins or in a location where such equipment and controls would be endangered by fire in the diked area or drainage basin. Piping aboveground shall be minimized and located as close as practical to the shell of the tank in diked areas or drainage basins.

7902.3 Container and Portable Tank Storage Outside of Buildings.

7902.3.1 General. Storage of flammable and combustible liquids in closed containers and portable tanks outside of buildings shall be in accordance with Sections 7902.1 and 7902.3. See also Section 7902.1.8.1 for capacity limits for containers and portable tanks.

7902.3.2 Plans. See Section 7901.3.2. Storage shall be in accordance with approved plans.

7902.3.3 Location on property.

7902.3.3.1 General. Outdoor storage of liquids in containers and portable tanks shall be in accordance with Table 7902.3-A. Storage of liquids near buildings located on the same property shall be in accordance Section 7902.3.3.

When two or more classes of materials are stored in a single pile, the quantity in the pile shall not exceed the smallest of maximum quantities for the classes of material stored.

Storage of containers or portable tanks shall be provided with fire apparatus access roads in accordance with Section 902.2.

The storage area shall be protected against tampering or trespassers where necessary and shall be kept free of weeds, debris and other combustible materials not necessary to the storage.

7902.3.3.2 Storage adjacent to buildings. A maximum of 1,100 gallons (4163.5 L) of liquids stored in closed containers and portable tanks is allowed adjacent to a building located on the same premises and under the same management, provided that:

1. The building does not exceed one story in height. Such building shall be of fire-resistive construction with noncombustible exterior surfaces or noncombustible construction and shall be devoted principally to the storage of liquids, or

2. The exterior building wall adjacent to the storage area shall have a fire-resistance rating of not less than two hours, having no openings to abovegrade areas within 10 feet (3048 mm) horizontally of such storage and no openings to belowgrade areas within 50 feet (15 240 mm) horizontally of such storage.

The quantity of liquids stored adjacent to a building protected in accordance with Item 2 is allowed to exceed 1,100 gallons (4163.5 L), provided that the maximum quantity per pile does not exceed 1,100 gallons (4163.5 L) and each pile is separated by a 10-foot-minimum (3048 mm) clear space along the common wall.

Where the quantity stored exceeds 1,100 gallons (4163.5 L) adjacent to a building complying with Item 1, or the provisions of Item 1 cannot be met, a minimum distance in accordance with the column for distance to property line that can be built on in Table 7902.3-A shall be maintained between buildings and the nearest container or portable tank.

7902.3.4 Spill control, drainage control and secondary containment. Storage areas shall be provided with spill control, drainage control and secondary containment as set forth in Section 7901.8.

EXCEPTION: Containers stored on approved containment pallets in accordance with Section 7901.8.5.

7902.3.5 Security. Storage areas shall be protected against tampering or trespassers by fencing or other control measures.

7902.3.6 Protection from vehicles. Guard posts or other means shall be provided to protect exterior storage tanks from vehicular damage. When guard posts are installed, the posts shall be installed in accordance with Section 8001.9.3.

7902.3.7 Clearance from combustibles. The storage area shall be kept free of weeds, debris and combustible materials not necessary to the storage. The area surrounding an exterior storage area shall be kept clear of such materials for a minimum distance of 15 feet (4572 mm).

7902.3.8 Weather protection. For weather protection for outdoor storage, see Section 8003.1.20.

7902.3.9 Empty containers and tank storage. The storage of empty tanks and containers previously used for the storage of flammable or combustible liquids, unless free from explosive vapors, shall be stored as required for filled containers and tanks. Tanks and containers when emptied shall have the covers or plugs immediately replaced in openings.

7902.4 Stationary Aboveground Tank Storage inside Buildings.

7902.4.1 General. Storage of flammable and combustible liquids in stationary aboveground tanks inside of buildings shall be in accordance with Sections 7902.1 and 7902.4.

7902.4.2 Where allowed. Stationary tanks for the storage of flammable and combustible liquids shall be in rooms or buildings complying with the Building Code.

Rooms or buildings used for storage of Class I, II or III liquids shall be in accordance with Section 7902.5.7.

Rooms or buildings used for dispensing, use, mixing and handling of Class I, II or III liquids shall be in accordance with Section 7903.2.1.6.

7902.4.3 Openings for manual gaging. Openings for manual gaging, if independent of the fill pipe, shall be provided with a liquid-tight cover. Covers shall be kept closed when not in use. Such openings shall be protected against liquid overflow and possible vapor release by means of a spring-loaded check valve or other approved devices.

7902.5 Container and Portable Tank Storage inside Buildings.

7902.5.1 General.

7902.5.1.1 Applicability. Storage of flammable and combustible liquids inside buildings in drums or other containers and portable tanks shall be in accordance with Sections 7902.1 and 7902.5.

EXCEPTIONS: 1. Liquids in the fuel tanks of motor vehicles, aircraft, boats, or portable or stationary engines.
2. The storage of distilled spirits and wines in wooden barrels or casks.

7902.5.1.2 Fire protection.

7902.5.1.2.1 Portable fire extinguishers. Approved portable fire extinguishers shall be provided in accordance with U.F.C. Standard 10-1, except as specified in Section 7902.5.11.5.2.

7902.5.1.2.2 Water supply. The water supply shall be sufficient to deliver the specified fire-protection demand, including at least 500 gallons per minute (31.5 L/s) for inside and outside hose lines.

7902.5.2 Capacity limits for containers and portable tanks. Containers shall not exceed 60 gallons (227.1 L) capacity. Portable tanks shall not exceed 660 gallons (2498 L) capacity. See Section 7902.1.8.1. Tanks exceeding 660 gallons (2498 L) capacity shall be in accordance with Sections 7902.2, 7902.4 or 7902.6.

7902.5.3 Empty containers and portable tanks. Empty tanks and containers previously used for the storage of flammable or combustible liquids, unless free from explosive vapors, shall be stored as required for filled tanks and containers.

Tanks and containers, when emptied, shall have the covers or plugs immediately replaced in openings.

7902.5.4 Incompatible materials. Materials which will react with water or other liquids to produce a hazard shall not be stored in the same room with flammable or combustible liquids. See also Section 7902.1.6.

7902.5.5 Storage near exits. Class I, II or III-A liquids, including stock for sale, shall not be stored near exit doorways, stairways or in a location that would impede egress.

7902.5.6 Shelf storage.

7902.5.6.1 General. Shelving shall be of substantial construction, adequately braced and anchored. For seismic requirements, see the Building Code.

7902.5.6.2 Displacement protection. Shelves shall be of sufficient depth and provided with a lip or guard to prevent individual containers from being easily displaced.

EXCEPTION: Shelves in storage cabinets or on laboratory furniture specifically designed for such use.

7902.5.6.3 Manner of storage. Shelf storage of flammable and combustible liquids shall be maintained in an orderly manner.

7902.5.7 Quantity limits for storage.

7902.5.7.1 Exempt amounts for control areas. For occupancies other than Group M Occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the exempt amounts set forth in Table 7902.5-A and shall not exceed the additional limitations set forth in Section 7902.5.7.2.

For Group M Occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the exempt amounts set forth in Table 7902.5-B.

See Article 51 for storage of hazardous production material flammable and combustible liquids in Group H, Division 6 Occupancies.

7902.5.7.2 Occupancy quantity limits. The following limits for quantities of stored flammable or combustible liquids shall not be exceeded:

1. **Group A Occupancies:**

Quantities in Group A Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5-A.

2. **Group B Occupancies:**

Quantities in drinking, dining, office and school uses within Group B Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5-A.

3. **Group E Occupancies:**

Quantities in Group E Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5-A.

4. **Group F Occupancies:**

Quantities in dining, office and school uses within Group F Occupancies shall not exceed amounts necessary for demonstration, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5-A.

5. **Group I Occupancies:**

Quantities in Group I Occupancies shall not exceed amounts necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5-A.

6. **Group M Occupancies:**

Quantities in dining, office and school uses within Group M Occupancies shall not exceed amounts necessary for demonstration, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5-A.

See Section 7902.5.7.1 for exempt amounts for wholesale and retail sales uses.

7. **Group R Occupancies:**

Quantities in Group R Occupancies shall not exceed amounts necessary for maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5-A.

8. **Group S Occupancies:**

Quantities in dining and office uses within Group S Occupancies shall not exceed amounts necessary for demonstration, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 7902.5-A.

7902.5.7.3 Quantities exceeding limits for control areas. Quantities exceeding quantities allowed in control areas set forth in Sections 7902.5.7.1 and 7902.5.7.2 shall be in liquid storage rooms or liquid storage warehouses in accordance with Sections 7902.5.11 and 7902.5.12.

7902.5.8 Special provisions for liquids used for maintenance and operation of equipment. In all occupancies, quantities of flammable and combustible liquids in excess of 10 gallons (37.85 L) used for maintenance purposes and the operation of equipment shall be stored in liquid storage cabinets in accordance with Section 7902.5.9. Quantities not exceeding 10 gallons (37.85 L) are allowed to be stored outside of a cabinet when in approved containers located in private garages or other approved locations.

In Groups A, B, E, F, I, M, R and S Occupancies, quantities of flammable and combustible liquids used for demonstration, treatment and laboratory work exceeding 10 gallons (37.85 L) shall be stored in liquid storage cabinets in accordance with Section 7902.5.9. Quantities not exceeding 10 gallons (37.85 L) shall be in approved locations.

7902.5.9 Liquid storage cabinets.

7902.5.9.1 General. When other sections of this code require that liquid containers are stored in storage cabinets, such cabinets and storage shall be in accordance with Section 7902.5.9.

7902.5.9.2 Quantities. The combined quantity of Class I and II liquids in a cabinet shall not exceed 60 gallons (227.1 L), and the total quantities of all liquids shall not exceed 120 gallons (454.2 L).

7902.5.9.3 Construction.

7902.5.9.3.1 Labeling. Cabinets shall be provided with a conspicuous label in red letters on contrasting background which reads FLAMMABLE—KEEP FIRE AWAY.

7902.5.9.3.2 Doors. Doors shall be well fitted, self-closing and equipped with a latch.

7902.5.9.3.3 Bottom. The bottom of the cabinet shall be liquid tight to a height of at least 2 inches (50.8 mm).

7902.5.9.3.4 Materials. Cabinets shall be constructed of wood or metal and approved by the chief. Cabinets shall be listed or constructed in accordance with the following:

1. Unlisted metal cabinets shall be constructed of steel having a thickness of not less than 0.044 inch (1.12 mm) (18 gage). The cabinet, including the door, shall be double walled with 1 1/2-inch (38.1 mm) airspace between the walls. Joints shall be riveted or welded and shall be tightfitting.

2. Unlisted wooden cabinets, including doors, shall be constructed of not less than 1-inch (25.4 mm) exterior grade plywood. Joints shall be rabbited and shall be fastened in two directions with wood screws. Door hinges shall be of steel or brass. Cabinets shall be painted with an intumescent-type paint.

7902.5.9.4 Number of cabinets.

7902.5.9.4.1 Group A Occupancies. Group A Occupancies shall not contain more than one cabinet.

7902.5.9.4.2 Other occupancies. In occupancies other than Group A Occupancies, a room shall not contain more than three cabinets.

EXCEPTION: Cabinets in groups not exceeding three are allowed in the same room, provided they are separated from other cabinets by not less than 100 feet (30 480 mm).

7902.5.10 Storage in control areas.

7902.5.10.1 General. Storage in control areas shall be in accordance with the following:

1. Class I liquids shall not be stored in basements,

2. Containers having less than 30-gallon (113.6 L) capacity shall not be stacked more than 3 feet (914.4 mm) or two containers high, whichever is greater, unless stacked on fixed shelving or otherwise satisfactorily secured. Containers having a capacity of 30 gallons (113.6 L) or more shall not be stored more than one container high. Containers shall be stored in an upright position,

3. Containers on shelves shall be stored in accordance with Table 7902.5-C. Combustible commodities shall not be stored above flammable or combustible liquids,

4. Piles shall not be closer than 3 feet (914.4 mm) to the nearest beam, chord, girder or other obstruction and shall be 3 feet (914.4 mm) below sprinkler deflectors or discharge orifices of water spray or other overhead fire-protection systems, and

5. In areas that are not accessible to the public, Class I, II and III-A liquids shall not be stored in the same pile or rack section as ordinary combustible commodities unless such materials are packaged together as kits.

7902.5.10.2 Group M Occupancy wholesale and retail sales uses.

7902.5.10.2.1 General. Flammable and combustible liquids in Group M Occupancy wholesale and retail sales uses shall be in accordance with Section 7902.5.10.2.

7902.5.10.2.2 Container type. Containers for Class I liquids shall be metal.

EXCEPTION: In sprinklered buildings an aggregate quantity of 120 gallons (454.2 L) of water miscible Class I-B and I-C liquids is allowed in nonmetallic containers, each having a capacity of 16 ounces (0.473 L) or less.

See also Section 7902.1.8.1.3.

7902.5.10.2.3 Container capacity. Containers for Class I liquids shall not exceed 5-gallon (18.9 L) capacity.

7902.5.10.2.4 Fire protection and storage arrangement. Fire protection and container storage arrangement shall be in accordance with Table 7902.5-C and the following:

1. Combustible commodities shall not be stored above flammable or combustible liquids,

2. Storage on shelves shall not exceed 6 feet (1828.8 mm) in height, and shelving shall be metal,

3. Storage on pallets or in piles greater than 4 feet 6 inches (1371.6 mm) in height, or where the ceiling exceeds 18 feet (5486.4 mm) in height, shall be protected in accordance with Table 7902.5-F, and the storage heights and arrangement shall be limited to those specified in Table 7902.5-D, and

4. Storage on racks greater than 4 feet 6 inches (1371.6 mm) in height, or where the ceiling exceeds 18 feet (5486.4 mm) in height, shall be protected in accordance with Tables 7902.5-H, 7902.5-I and 7902.5-J as appropriate, and the storage heights and arrangements shall be limited to those specified in Table 7902.5-E.

7902.5.10.2.5 Storage plan. When required by the chief, aisle and storage plans shall be submitted in accordance with Section 8003.1.6.

7902.5.11 Liquid storage rooms.

7902.5.11.1 General. Quantities of liquids exceeding those set forth in Section 7902.5.7 for storage in control areas shall be stored in a liquid storage room complying with Section 7902.5.11 and constructed and separated as required by the Building Code.

7902.5.11.2 Quantities and arrangement of storage.

7902.5.11.2.1 General. The quantity limits and arrangements of liquid storage in liquid storage rooms shall be in accordance with Table 7902.5-D or 7902.5-E and Section 7902.5.11.2.

7902.5.11.2.2 Mixed storage. When two or more classes of liquids are stored in a pile or rack section:

1. The quantity in that pile or rack shall not exceed the smallest of the maximum quantities for the classes of liquids stored in accordance with Table 7902.5-D or 7902.5-E, and

2. The height of storage in that pile or rack shall not exceed the smallest of the maximum heights for the classes of liquids stored in accordance with Table 7902.5-D or 7902.5-E.

7902.5.11.2.3 Separation and aisles. Piles shall be separated from each other by at least 4-foot (1219.2 mm) aisles. Aisles shall be provided so that all containers are 12 feet (3657.6 mm) or less from an aisle. Where the storage of liquids is on racks, a minimum 4-foot-wide (1219.2 mm) aisle shall be provided between adjacent rows of racks and adjacent storage of liquids. Main aisles shall be a minimum of 8 feet (2438.4 mm) wide.

Additional aisles shall be provided for access to doors, required windows and ventilation openings, standpipe connections, mechanical equipment, and switches. Such aisles shall be at least 3 feet (914.4 mm) in width, unless greater widths are required for separation of piles or racks, in which case the greater width shall be provided.

7902.5.11.2.4 Stabilizing and supports. Containers and piles shall be separated by pallets or dunnage to provide stability and to prevent excessive stress to container walls. Portable tanks stored over one tier high shall be designed to nest securely without dunnage. See U.F.C. Standard 79-5 for requirements for portable tank design. Shelving, racks, dunnage, scuffboards, floor overlay and similar installations shall be of noncombustible construction or of wood not less than 1-inch (25.4 mm) nominal thickness. Adequate material-handling equipment shall be available to handle tanks safely at upper tier levels.

7902.5.11.3 Spill control, drainage control and secondary containment. Liquid storage rooms shall be provided with spill control, drainage control and secondary containment in accordance with Section 7901.8.

7902.5.11.4 Ventilation. Liquid storage rooms shall be ventilated in accordance with Section 8003.1.8.

7902.5.11.5 Fire protection.

7902.5.11.5.1 Fire-extinguishing systems. Liquid storage rooms shall be protected by automatic sprinkler systems installed in accordance with the Building Code (see U.B.C. Standard 9-1) and Table 7902.5-F, 7902.5-G, 7902.5-H, 7902.5-I or 7902.5-J. In-rack sprinklers shall also comply with U.F.C. Standard 81-2.

Automatic foam-water systems and automatic aqueous film forming foam (AFFF)-water sprinkler systems may be used only when approved by the chief.

7902.5.11.5.2 Portable fire extinguishers. One or more portable fire extinguisher having a rating of not less than 20-B shall be located not less than 10 feet (3048 mm) or more than 50 feet (15 240 mm) from any Class I or II liquid storage area located outside of a liquid storage room.

One or more portable fire extinguishers having a rating of not less than 20-B shall be located outside of, but not more than 10 feet (3048 mm) from, the door opening into a liquid storage room.

7902.5.11.6 Basement storage. Class I liquids shall not be stored in basements.

7902.5.11.7 Explosion control. See Section 7902.1.5.

7902.5.12 Liquid storage warehouses.

7902.5.12.1 General. Buildings used for storage of flammable or combustible liquids in quantities exceeding those set forth in Section 7902.5.7 for control areas and Section 7902.5.11.2 for liquid storage rooms shall comply with Section 7902.5.12 and shall be constructed and separated as required by the Building Code.

7902.5.12.2 Quantities and storage arrangement.

7902.5.12.2.1 General. The total quantities of liquids in a liquid storage warehouse are not limited. The arrangement of storage shall be in accordance with Table 7902.5-D or 7902.5-E.

7902.5.12.2.2 Mixed storage. Mixed storage shall be in accordance with Section 7902.5.11.2.2.

7902.5.12.2.3 Separation and aisles. Separation and aisles shall be in accordance with Section 7902.5.11.2.3.

7902.5.12.2.4 Stabilizing and supports. Stabilizing and supports shall be in accordance with Section 7902.5.11.2.4.

7902.5.12.3 Spill control, drainage control and secondary containment. Liquid storage warehouses shall be provided with spill control, drainage control and secondary containment as set forth in Section 7901.8.

7902.5.12.4 Ventilation. Liquid storage warehouses shall be ventilated in accordance with Section 8003.1.8.

7902.5.12.5 Fire protection.

7902.5.12.5.1 Fire-extinguishing systems. Liquid storage warehouses shall be protected by automatic sprinkler systems installed in accordance with the Building Code (see U.B.C. Standard 9-1) and Table 7902.5-F, 7902.5-G, 7902.5-H, 7902.5-I or 7902.5-J. In-rack sprinklers shall also comply with U.F.C. Standard 81-2.

Automatic foam-water systems and automatic aqueous film forming foam-water sprinkler systems may only be used when approved by the chief.

7902.5.12.5.2 Warehouse hose lines. In liquid storage warehouses, either 1½-inch (38.1 mm) lined or 1-inch (25.4 mm) hard rubber hand hose lines shall be provided in sufficient number to reach all liquid storage areas. See also Section 1001.9.

7902.5.12.6 Basement storage. Class I liquids shall not be stored in basements.

7902.5.12.7 Explosion control. See Section 7902.1.5.

7902.6 Underground Tank Storage.

7902.6.1 General. Underground storage of flammable and combustible liquids in tanks shall be in accordance with Sections 7902.1 and 7902.6.

7902.6.2 Contents. Underground tanks shall not contain petroleum products containing mixtures of a nonpetroleum nature, such as ethanol or methanol blends, without evidence of compatibility.

7902.6.3 Location. Flammable and combustible liquid storage tanks located underground, either outside or under buildings, shall be in accordance with the following:

1. Tanks shall be located with respect to existing foundations and supports such that the loads carried by the latter cannot be transmitted to the tank,

2. The distance from any part of a tank storing liquids to the nearest wall of a basement, pit, cellar or property line shall not be less than 3 feet (914.4 mm), and

3. A minimum distance of 1 foot (304.8 mm), shell to shell, shall be maintained between underground tanks.

7902.6.4 Depth and cover. Excavation for underground storage tanks shall be made with due care to avoid undermining of foundations of existing structures. Underground tanks shall be set on firm foundations and surrounded with at least 6 inches (152.4 mm) of noncorrosive inert material such as clean sand or gravel well tamped in place or in accordance with the manufacturer's installation instructions. Tanks shall be covered with a minimum of 2 feet (609.6 mm) of earth or shall be covered by not less than 1 foot (304.8 mm) of earth, on top of which shall be placed a slab of reinforced concrete not less than 4 inches (101.6 mm) thick.

When underground tanks are, or are likely to be, subjected to traffic, they shall be protected against damage from vehicles passing over them by at least 3 feet (914.4 mm) of earth cover, or 18 inches (457.2 mm) of well-tamped earth plus 6 inches (152.4 mm) of reinforced concrete, or 8 inches (203.2 mm) of asphaltic concrete. When asphaltic or reinforced concrete paving is used as part of the protection, it shall extend at least 1 foot (304.8 mm) horizontally beyond the outline of the tank in all directions.

For tanks built in accordance with Section 7902.1.8, the burial depth and the height of the vent line shall be such that

the static head imposed at the bottom of the tank will not exceed 10 psig (68.9 kPa) if the fill or vent pipe is filled with liquid.

If the depth of cover exceeds 7 feet (2133.6 mm) or the manufacturer's specifications, reinforcements shall be provided in accordance with the tank manufacturer's recommendations.

Nonmetallic underground tanks shall be installed in accordance with the manufacturer's instructions. The minimum depth of cover shall be as specified above in Section 7902.6.4.

7902.6.5 Overfill protection.

7902.6.5.1 General. Fill pipes shall be equipped with a spill container and an overfill prevention system as specified in Section 7902.6.5.

7902.6.5.2 Spill containers. A spill container shall be provided for each fill pipe to collect liquids spilled by overfilling during tank-filling operations. Containers are allowed to be constructed of single-wall construction. Containers shall have a capacity of not less than five gallons (18.9 L) and shall be equipped with a drain valve which drains a spill into the primary tank.

7902.6.5.3 Overfill prevention system. An overfill prevention system shall be provided for each tank. The system shall either:

1. Have an alarm which provides an audible and visual signal when the quantity of liquid in the tank reaches 90 percent of tank capacity,

2. Automatically shut off the flow when the quantity of liquid in the tank reaches 95 percent of tank capacity, or

3. Reduce the flow rate to not more than 15 gallons per minute (0.95 L/s) so that, at the reduced flow rate, the tank will not overfill for 30 minutes, and automatically shut-off flow into the tank so that none of the fittings on the top of the tank are exposed to product due to overfilling.

7902.6.6 Inventory control. Daily inventory records shall be maintained for underground storage tank systems in accordance with Section 5202.3.9.

7902.6.7 Locations subject to flooding. Where a tank could become buoyant due to a rise in the level of the water table or due to location in an area that is subject to flooding, the tank shall be anchored in place. See Appendix II-B or manufacturer's installation instructions.

7902.6.8 Leaking tanks. Leaking tanks shall be handled in accordance with WAC 173-360-325.

7902.6.9 Used tanks. Reinstallation of used tanks is allowed when such tanks comply with the requirements of Sections 7902.1.8 and 7902.6.15. See also Section 7902.6.16.4.

7902.6.10 Tank lining. Steel tanks are allowed to be lined only for the purpose of protecting the interior from corrosion or providing compatibility with a material to be stored. Only those liquids tested for compatibility with the lining material are allowed to be stored in lined tanks. Lining of leaking underground storage tanks shall be done in accordance with the provisions of WAC 173-360-325.

Tank opening, cleaning, preparation, inspection, lining, closing and testing shall be in accordance with U.F.C. Standard 79-6.

For permits to alter a tank, see Section 105, Permit f.3.6.

Interior-lined underground tanks shall be protected from corrosion in accordance with Section 7902.6.15.

7902.6.11 Secondary containment. An approved method of secondary containment shall be provided for underground tank systems, including tanks, piping and related components, where a leak from such a system would pose an immediate hazard to persons or property, as determined by the chief. See Appendix II-G.

7902.6.12 Leak detection required. Underground storage tank systems shall be provided with an approved method of detecting leaks from any component of the system which normally contains liquid.

7902.6.13 Leak-detection installation and maintenance. Leak-detection devices and methods shall be in accordance with nationally recognized standards. See Article 90, Standard u.3.2. Such devices shall be inspected and tested at least annually, and the test results maintained for at least one year.

7902.6.14 Leak reporting. Any consistent or accidental loss of liquid, or other indication of a leak from a tank system, shall be reported immediately to the fire department.

7902.6.15 Corrosion protection.

7902.6.15.1 General. Underground tanks and piping shall be properly designed, installed and maintained, and protected from corrosion in accordance with Section 7902.6.15.2 or 7902.6.15.3.

EXCEPTION: If conditions, based on adequate proof, warrant the deletion of the corrosion-protection requirements, the chief may waive the corrosion-protection requirements.

See Article 90, Standards a.3.10, n.1.2, s.1.1, u.1.14 and u.2.1.

7902.6.15.2 Cathodic protection. Cathodic protection systems provided for corrosion protection shall be in accordance with recognized standards. See WAC 173-360-320.

7902.6.15.3 Corrosion-resistant materials. Corrosion-resistant materials of construction, such as special alloys; nonmetallic, reinforced plastic coatings; composites; or equivalent systems, may be used when approved.

7902.6.15.4 Testing of corrosion protection. New underground steel tanks and piping shall be tested by the structure-to-soil-potential method after the system is in operation. The tank manufacturer shall provide a structure lead and a test station. The criteria for adequate corrosion protection shall be in accordance with recognized standards. Testing shall be done at installation and not less than once every five years thereafter by qualified persons approved by the chief.

EXCEPTION: Approved and listed composite fiberglass-reinforced plastic tanks.

7902.6.16 Testing of underground tanks.

7902.6.16.1 General. Before being covered or placed in use, tanks and piping connected to underground tanks shall be tested for tightness in the presence of the chief. For pipe testing, see Section 7901.11.10. The system shall not be covered until it has been approved.

7902.6.16.2 New tanks. New underground tanks shall be tested for tightness hydrostatically or pneumatically at not less than 3 pounds per square inch (20.7 kPa) and not more than 5 pounds per square inch (34.5 kPa) for 30 minutes. Pneumatic testing shall not be used on a tank containing flammable or combustible liquids or vapors.

When secondary containment tanks are required in accordance with Section 7902.6.11, they shall be tested in accordance with the manufacturer's instructions. Both the primary and secondary containment shall be tested.

7902.6.16.3 Existing tanks and piping. Existing underground storage tanks and piping shall be tested for leakage at the owner's or operator's expense when the chief has reasonable cause to believe that a leak exists. Orders by the chief requiring testing on underground tanks or piping shall indicate that the test be completed by a specified date. Tanks shall be emptied of flammable or combustible liquids, and piping and other equipment shall not be used if required tests are not completed within the specified time.

When testing is required, owners or operators shall provide the chief with data setting forth the method of testing that is to be used and shall submit the name of a qualified individual who will conduct the test. The method of testing to be used shall consider the effects of temperature, pressure and other variables and shall establish conclusively whether the tank or piping is leaking. Pneumatic testing shall not be used for tanks.

Devices used for final testing of tanks shall be capable of detecting leaks as small as 0.05 gallon per hour (0.19 L/hr). Leaking piping and equipment shall not be used until repaired or replaced.

The chief is authorized to require that the test be conducted in the chief's presence.

7902.6.16.4 Used tanks. Used tanks intended for flammable or combustible liquid service shall be tested as required for new tanks.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-7902, filed 12/21/94, effective 6/30/95.]

WAC 51-34-7904 Section 7904—Special operations.

7904.1 General. The following special operations shall be in accordance with Sections 7901, 7902 and 7903 except as provided in Section 7904.

1. Storage and dispensing of flammable and combustible liquids on farms and construction sites.
2. Well drilling and operating.
3. Bulk plants or terminals.
4. Loading and unloading of tank vehicles and tank cars.
5. Tank vehicles and tank vehicle operation.
6. Refineries.

7904.2 Storage and Dispensing of Flammable and Combustible Liquids on Farms and Construction Sites.

7904.2.1 General. Permanent and temporary storage and dispensing of Class I and II liquids for private use on farms and rural areas and at construction sites, earth-moving projects, gravel pits or borrow pits shall be in accordance with Section 7904.2.

EXCEPTION: Storage and use of fuel-oil and containers connected with oil-burning equipment regulated by Article 61 and the Mechanical Code.

7904.2.2 Combustibles and open flames near tanks. Storage areas shall be kept free of weeds and extraneous combustible material. Open flames and smoking are prohibited in flammable or combustible liquid storage areas.

7904.2.3 Marking of tanks and containers. Tanks and containers for the storage of liquids aboveground shall be conspicuously marked with the name of the product which they contain and FLAMMABLE—KEEP FIRE AND FLAME AWAY. Tanks shall bear the additional marking KEEP 50 FEET (15.2 Meters) FROM BUILDINGS.

7904.2.4 Containers for storage and use. Metal containers used for storage of Class I or II liquids shall be in accordance with DOT requirements or shall be of an approved design.

Discharge devices shall be of a type that does not develop an internal pressure on the container. Pumping devices or approved self-closing faucets used for dispensing liquids shall not leak and shall be well maintained. Individual containers shall not be interconnected and shall be kept closed when not in use.

Containers stored outside and inside of buildings shall be in accordance with Section 7902 and the Building Code.

7904.2.5 Permanent and temporary tanks for storage and use.

7904.2.5.1 General. The capacity of permanent aboveground tanks containing Class I or II liquids shall not exceed 1,100 gallons (4163.9 L). The capacity of temporary aboveground tanks containing Class I or II liquids shall not exceed 10,000 gallons (37 854 L). Tanks shall be of single-compartment design, constructed in accordance with Section 7902.1.2.

7904.2.5.2 Fill opening security. Fill openings shall be equipped with a locking closure device. Fill openings shall be separate from vent openings.

7904.2.5.3 Vents. Each tank shall be provided with a free-opening vent of a size not less than specified in Table 7904.2-A to relieve vacuum or pressure which could develop in normal operation or from a fire exposure. Venting shall be in accordance with Section 7902.1.10.

Vents shall be arranged to discharge in a manner which prevents localized overheating or flame impingement on any

part of the tank in the event vapors from such vents are ignited.

7904.2.5.4 Location.

7904.2.5.4.1 General. Tanks containing Class I or II liquids shall be kept outside of and at least 50 feet (15 240 mm) from buildings and combustible storage. Additional distance shall be provided when necessary to ensure that vehicles, equipment and containers being filled directly from such tanks will not be less than 50 feet (15 240 mm) from structures, haystacks or other combustible storage.

7904.2.5.4.2 Locations where aboveground tanks are prohibited. The storage of Class I and II liquids in aboveground tanks is prohibited within the limits established by law as the limits of districts in which such storage is prohibited. (See sample adoption ordinance, Section 4.)

7904.2.5.5 Type of tank.

7904.2.5.5.1 General. Tanks shall be provided with top openings only or shall be elevated for gravity discharge.

7904.2.5.5.2 Tanks with top openings only. Tanks with top openings only shall be mounted as follows:

1. On well-constructed metal legs connected to shoes or runners designed so that the tank is stabilized and the entire tank and its supports can be moved as a unit, or

2. For stationary tanks, on a stable base of timbers or blocks approximately 6 inches (152.4 mm) in height which prevents the tank from contacting the ground.

Tanks with top openings only shall be equipped with a tightly and permanently attached, approved pumping device having an approved hose of sufficient length for filling vehicles, equipment or containers to be served from the tank. Either the pump or the hose shall be equipped with a padlock to its hanger to prevent tampering. An effective antisiphoning device shall be included in the pump discharge unless a self-closing nozzle is provided. Siphons or internal pressure discharge devices shall not be used.

7904.2.5.5.3 Tanks for gravity discharge. Tanks with a connection in the bottom or the end for gravity dispensing liquids shall be mounted and equipped as follows:

1. Supports to elevate the tank for gravity discharge shall be of adequate strength and designed to provide stability, and

2. Bottom or end openings for gravity discharge shall be equipped with a valve located adjacent to the tank shell which will close automatically in the event of fire through the operation of an effective heat-actuated releasing device. If this valve cannot be operated manually, it shall be supplemented by a second manually operated valve. The gravity discharge outlet shall be provided with an approved hose equipped with a self-closing valve at the discharge end of a type that can be padlocked to its hanger.

7904.2.6 Spill control, drainage control and diking. Indoor storage and dispensing areas shall be provided with spill control and drainage control as set forth in Section 7901.8. Outdoor storage areas shall be provided with drainage control or diking as set forth in Section 7902.2.8.

7904.2.7 Portable fire extinguishers. Portable fire extinguishers with a minimum rating of 20-B:C shall be provided when required by the chief.

7904.2.8 Dispensing from tank vehicles.

7904.2.8.1 General. When approved by the chief, liquids used as fuels may be transferred from tank vehicles into the tanks of motor vehicles or special equipment, provided:

1. The tank vehicle's specific function is that of supplying fuel to motor vehicle fuel tanks,

2. The dispensing line does not exceed 50 feet (15 240 mm) in length,

3. The dispensing nozzle is an approved type,

4. The dispensing hose is properly placed on the approved reel or in a compartment provided before the tank vehicle is moved,

5. Signs prohibiting smoking or open flame within 25 feet (7 620 mm) of a tank vehicle or the point of refueling are prominently posted on the tank vehicle,

6. Electrical devices and wiring in areas where fuel dispensing is conducted are in accordance with the Electrical Code,

7. Vapor-recovery systems are provided in accordance with Section 5202.12,

8. Tank vehicle dispensing equipment is operated only by designated personnel who are trained to handle and dispense motor fuels, and

9. Provisions are made for controlling and mitigating unauthorized discharges.

7904.2.8.2 Location. Dispensing from tank vehicles shall be conducted at least 50 feet (15 240 mm) from structures or combustible storage.

7904.3 Well Drilling and Operating.

7904.3.1 General. Wells for oil and natural gas shall be drilled and operated in accordance with Section 7904.3.

7904.3.2 Location.

7904.3.2.1 Storage tanks and sources of ignition. Well heads shall not be located within 25 feet (7 620 mm) of storage tanks or boilers, fired heaters, open-flame devices or other sources of ignition. Smoking is prohibited at wells or tank locations except as designated and in posted areas approved by the chief.

EXCEPTION: Engines used in the drilling, production and serving of wells.

7904.3.2.2 Streets and railways. Wells shall not be drilled within 75 feet (22 860 mm) of any dedicated public street, highway or nearest rail of an operating railway.

7904.3.2.3 Buildings. Wells shall not be drilled within 100 feet (30 480 mm) of buildings not necessary to the operation of the well.

Wells shall not be drilled within 300 feet (91 440 mm) of buildings used as a place of assembly, institution or school.

When wells are existing, buildings shall not be constructed within the distances set forth in Section 7904.3 for separation of wells and buildings.

7904.3.3 Waste Control.

7904.3.3.1 Discharge on a street or water channel. Liquids containing crude petroleum or its products shall not be discharged into or on streets, highways, drainage canals or ditches, storm drains, or flood-control channels.

7904.3.3.2 Discharge and combustible materials on ground. The surface of the ground under, around or near wells, pumps, boilers, oil storage tanks or buildings shall be kept free of oil, waste oil, refuse or waste material.

EXCEPTION: Material within an oil sump or tank.

7904.3.3.3 Clearing around wells and tanks. Land within 25 feet (7620 mm) of wells, flammable or combustible liquid tanks, or other appurtenances to such wells shall be kept free of dry weeds, grass, rubbish or other combustible material at all times. When, in the opinion of the chief, the distance is not sufficient to provide reasonable fire safety, a greater distance may be required, not to exceed the height of a derrick or greatest dimension of a tank.

7804.3.4 Sumps.

7904.3.4.1 Maximum width. Sumps or other basins for the retention of oil or petroleum products shall not exceed 12 feet (3658 mm) in width.

7904.3.4.2 Backfilling. Sumps or other basins for the retention of oil or petroleum products larger than 6 feet by 6 feet by 6 feet (1829 mm by 1829 mm by 1829 mm) shall not be maintained longer than 60 days after the cessation of drilling operations.

7904.3.4.3 Security. Sumps, diversion ditches and depressions used as sumps shall be securely fenced or covered.

7904.3.5 Prevention of blowouts. Adequate protection shall be provided to control and prevent the blowout of a well. Protection equipment shall meet federal, state and other applicable jurisdiction requirements.

7904.3.6 Storage tanks. Storage of flammable or combustible liquids in tanks shall be in accordance with Section 7902. Each oil storage tank or group of tanks shall have posted in a conspicuous place on or near such tank or tanks an approved sign with the name of the owner or operator, name or number of lease and the telephone number where a responsible person can be reached at any time.

7904.3.7 Soundproofing. Where soundproofing material is required during field operations, such material shall be noncombustible.

EXCEPTION: Fire-retardant treated material may be used and maintained when approved by the chief.

7904.3.8 Signs. Well locations shall have posted in a conspicuous place an approved sign with the name of the owner or operator, name or number of the lease, and number of the well. Such signs shall be maintained on the premises from the time materials are delivered for drilling purposes until the well is abandoned.

7904.3.9 Field loading racks. Field loading racks shall be in accordance with Section 7904.5.

7904.4 Bulk Plants or Terminals.

7904.4.1 General. Portions of properties where flammable and combustible liquids are received by tank vessels, pipelines, tank cars or tank vehicles and are stored or blended in bulk for the purpose of distributing such liquids by tank vessels, pipelines, tank cars, tank vehicles or containers shall be in accordance with Section 7904.4.

7904.4.2 Buildings.

7904.4.2.1 Construction. Buildings shall be constructed in accordance with the Building Code.

7904.4.2.2 Exits. Rooms in which liquids are stored, used or transferred by pumps shall have exits arranged to prevent occupants from being trapped in the event of fire.

7904.4.2.3 Heating. Rooms in which Class I liquids are stored or used shall be heated only by means not constituting a source of ignition, such as steam or hot water. Rooms containing heating appliances involving sources of ignition shall be located and arranged to prevent entry of flammable vapors.

7904.4.3 Ventilation.

7904.4.3.1 General. Ventilation shall be provided for rooms, buildings and enclosures in which Class I liquids are pumped, used or transferred. Design of ventilation systems shall consider the relatively high specific gravity of the vapors. When natural ventilation is used, adequate openings in outside walls at floor level, unobstructed except by louvers or coarse screens, shall be provided. Where natural ventilation is inadequate, mechanical ventilation shall be provided in accordance with the Mechanical Code.

7904.4.3.2 Basements and pits. Class I liquids shall not be stored or used within a building having a basement or pit into which flammable vapors can travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

7904.4.3.3 Dispensing of Class I liquids. Containers of Class I liquids shall not be drawn from or filled within buildings unless a provision is made to prevent the accumulation of flammable vapors in hazardous concentrations. Where mechanical ventilation is required, it shall be kept in operation while flammable vapors could be present.

7904.4.4 Storage. Storage of Class I, II and III-A liquids in bulk plants shall be in accordance with applicable provisions of Article 79.

7904.4.5 Wharves.

7904.4.5.1 General. Wharves, including piers, bulkheads and other structures over or contiguous to navigable water having a primary function of transferring liquid cargo in bulk between shore installations and tank vessels, ships, barges, lighter boats or other mobile floating craft, shall be in accordance with Section 7904.4.5.

EXCEPTION: Marine motor vehicle fuel-dispensing stations. See Section 5202.11.

7904.4.5.2 Transferring times. Package cargo of liquids, including full and empty drums, bulk fuel and stores, shall only be transported over a wharf during cargo transfer at such times and places as agreed on by the wharf superintendent and the senior deck officer on duty.

7904.4.5.3 Transferring locations. Wharves at which liquid cargoes are to be transferred in bulk quantities to or from tank vessels shall be at least 100 feet (30 480 mm) from bridges over a navigable waterway, or from an entrance to or superstructure of vehicular or railroad tunnels under a waterway. The termination of fixed piping used for loading or unloading at a wharf shall be at least 200 feet (60 960 mm) from bridges or from entrances to or superstructures of tunnels.

7904.4.5.4 Cargo vessels and transfer equipment. Substructure and decking shall be substantially designed for the use intended. Decking shall be constructed of materials which will afford the desired combination of flexibility, resistance to shock, durability, strength and fire resistance. Heavy timber construction is acceptable.

Installation of tanks used exclusively for ballast water or Class II or III liquids on suitably designed wharves is allowed.

Loading pumps capable of building up pressures in excess of the safe working pressure of cargo hose or loading arms shall be provided with bypasses, relief valves or other arrangements to protect the loading facilities against excessive pressure. Relief devices shall be tested at not more than yearly intervals to determine that they function satisfactorily at the pressure at which they are set.

Pressure hoses and couplings shall be inspected at intervals appropriate to the service. With the hose extended, hose and couplings shall be tested using in-service maximum operating pressures. Hoses showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings shall be withdrawn from service and repaired or discarded.

7904.4.5.5 Piping, valves and fittings. Piping, valves and fittings shall be in accordance with Section 7901.11, except as follows:

1. Flexibility of piping shall be assured by appropriate layout and arrangement of piping supports so that motion of the wharf structure resulting from wave action, currents, tides or the mooring of vessels will not subject the pipe to repeated strain above the elastic limit.

2. Pipe joints depending on the friction characteristics of combustible materials or grooving of pipe ends for mechanical continuity of piping shall not be used.

3. Swivel joints are allowed in piping to which hoses are connected and for articulated swivel-joint transfer systems. Swivel joints shall be designed such that the mechanical strength of the joint will not be impaired if the packing material were to fail.

4. Piping systems shall contain a sufficient number of valves to operate the system properly and to control the flow of liquid in normal operation and in the event of physical damage.

5. In addition to the requirements of Item 4, each line conveying Class I and II liquids leading to a wharf shall be provided with a readily accessible block valve located on shore near the approach to the wharf and outside of any diked area. Where more than one line is involved, the valves shall be grouped in one location.

6. Means of easy access shall be provided for cargo line valves located below the wharf deck.

7. Piping on wharves shall be adequately bonded and grounded if Class I and II liquids are transported. If excessive stray currents are encountered, insulating joints shall be installed. Bonding and grounding connections on all piping shall be located on the wharf side of hose riser insulating flanges, if used, and shall be accessible for inspection.

8. Hose or articulated swivel-joint pipe connections used for cargo transfer shall be capable of accommodating the combined effects of change in draft and maximum tidal range, and mooring lines shall be kept adjusted to prevent surge of the vessel from placing stress on the cargo transfer system.

9. Hoses shall be supported to avoid kinking and damage from chafing.

7904.4.5.6 Loading and unloading. Loading or discharging shall not commence until the wharf superintendent and officer in charge of the tank vessel agree that the tank vessel is properly moored and connections are properly made.

7904.4.5.7 Mechanical work. Mechanical work shall not be performed on the wharf during cargo transfer, except under special authorization by the chief based on a review of the area involved, methods to be employed and precautions necessary.

7904.4.6 Sources of ignition. Class I, II or III-A liquids shall not be used, drawn or dispensed where flammable vapors can reach a source of ignition. Smoking is prohibited except in designated locations. NO SMOKING signs shall be conspicuously posted where hazard from flammable vapors is normally present.

7904.4.7 Drainage control. Loading and unloading areas shall be provided with drainage control in accordance with Section 7901.8.

7904.4.8 Fire protection.

7904.4.8.1 General. Fire protection shall be in accordance with Articles 9 and 10 and Section 7904.4.8.

7904.4.8.2 Portable fire extinguishers. Suitable portable fire extinguishers with a rating of not less than 20-B shall be located within 75 feet (22 860 mm) of those portions of the facility where fires are likely to occur, such as hose connections, pumps and separator tanks.

7904.4.8.3 Fire hoses. Where piped water is available, ready-connected fire hose in a size appropriate for the water supply shall be provided so that manifolds where connections are made and broken can be reached by at least one hose stream.

7904.4.8.4 Obstruction of equipment. Material shall not be placed on wharves in such a manner which would

obstruct access to firefighting equipment or important pipeline control valves.

7904.4.8.5 Fire apparatus access. Where the wharf is accessible to vehicle traffic, an unobstructed roadway to the shore end of the wharf shall be maintained for access of firefighting apparatus. See Section 902.

7904.4.9 Overfill protection of Class I liquids. Manual and automatic systems shall be provided to prevent overfill during the transfer of Class I liquids from mainline pipelines and marine vessels in accordance with nationally recognized standards. See Article 90, Standard a.3.19.

7904.5 Loading and Unloading of Tank Vehicles and Tank Cars.

7904.5.1 General.

7904.5.1.1 Applicability. Tank vehicle and tank car loading and unloading shall be in accordance with Section 7904.5.

7904.5.1.2 Fire protection. Fire protection shall be provided in accordance with Article 10. Approved portable fire extinguishers shall be provided in accordance with U.F.C. Standard 10-1. Extinguishers having a minimum rating of 40-B shall be provided at each loading rack. Suitable fire-control devices, such as small hose or portable fire extinguishers, shall be available to protect locations where fires are likely to occur. The chief is authorized to require additional fire-control equipment where an unusual exposure hazard exists. Such additional fire-control equipment shall be sufficient to extinguish a fire in the largest tank. The design and amount of such equipment shall be in accordance with approved engineering standards.

7904.5.1.3 Spill control and drainage control. Areas where tank vehicle and tank car loading racks are located shall be provided with spill control and drainage control as set forth in Section 7901.8.

7904.5.2 Tank vehicle loading racks.

7904.5.2.1 Construction. Loading racks shall be constructed of noncombustible materials.

7904.5.2.2 Location. Loading racks dispensing Class I, II or III-A liquids shall be separated from tanks, warehouses or other plant buildings, and nearest property line of a property that can be built on by a clear distance of not less than 25 feet (7620 mm), measured from the nearest fill stem. Buildings for pumps or for shelter of loading personnel are allowed to be part of the loading rack.

7904.5.2.3 Static protection. Loading racks shall be equipped with protection to prevent the accumulation of static charges during truck-filling operations. Bonding facilities shall be provided during the loading of tank vehicles through open domes where Class I liquids are loaded, or where Class II and III liquids are loaded into vehicles which could contain vapors from previous cargoes of Class I liquids.

Protection shall consist of a metallic bond wire permanently electrically connected to the fill stem or to some part of the rack structure in electrical contact with the fill stem. The fill stem pipe assembly shall form a continuous electrically conductive path downstream from the point of bonding. The free end of such bond wire shall be provided with a clamp or equivalent device for convenient attachment to some metallic part in electrical contact with the cargo tank of the tank vehicle. Protection shall consist of a flexible bond wire of adequate strength for the intended service and the electrical resistance shall not exceed 1 megohm.

Such bonding connection shall be fastened to the vehicle or tank before dome covers are raised and shall remain in place until filling is completed and all dome covers have been closed and secured.

EXCEPTIONS:
1. Where vehicles are loaded exclusively with products not having a static-accumulating tendency, such as asphalts, cutback asphalts, most crude oils, residual oils and water-soluble liquids.
2. When Class I liquids are not handled at the loading facility and the tank vehicles loaded are used exclusively for Class II and III liquids.
3. Where vehicles are loaded or unloaded through closed top or bottom connections whether the hose or pipe is conductive or nonconductive.

Filling through open domes into the tanks of tank vehicles that contain vapor-air mixtures within the flammable range, or where the liquid being filled can form such a mixture, shall be by means of a downspout which extends to near the bottom of the tank.

7904.5.2.4 Drag chains. Drag chains or similar devices on tank vehicles shall not be used to meet the requirement of Section 7904.5.2.3 for static protection.

7904.5.2.5 Smoking. Approved signs which read NO SMOKING shall be maintained at entrance gates of bulk plants and near each loading rack.

7904.5.2.6 Security. Loading rack or properties on which a loading rack is located shall be surrounded by a fence not less than 5 feet (1524 mm) in height, constructed of wire mesh, solid metal sheathing or masonry. Tank vehicles shall not be loaded or unloaded unless such vehicles are entirely within the fenced area. Tank vehicles shall not be backed into or from the premises of a bulk plant.

EXCEPTION: Existing installations where adequate public safety exists due to isolation, natural barriers or other factors as determined by the chief.

7904.5.2.7 Top loading. When top loading a tank vehicle with Class I and II liquids without vapor control, valves used for the final control of flow shall be of the self-closing type and shall be manually held open except where automatic means are provided for shutting off the flow when the vehicle is full. Self-closing valves shall not be tied or locked in the open position.

When top loading a tank vehicle with vapor control, flow control shall be in accordance with Section 7904.5.2.8.

7904.5.2.8 Bottom loading. When bottom loading a tank vehicle with or without vapor control, a positive means shall be provided for loading a predetermined quantity of liquid, together with an automatic secondary shutoff control to prevent overfilling. The connecting components between the loading rack and the tank vehicle required to operate the secondary control shall be functionally compatible.

When bottom loading a tank vehicle that is equipped for vapor control and vapor control is not used, the tank shall be

vented to the atmosphere to prevent pressurization of the tank. Such venting shall be at a height equal to or greater than the top of the cargo tank on the vehicle.

When bottom loading a tank vehicle, the coupling between the liquid loading hose or pipe and the truck piping shall be a dry disconnect coupling.

Connections to the plant vapor-control system shall be designed to prevent the escape of vapor to the atmosphere when not connected to a tank vehicle.

Vapor-processing equipment shall be separated from aboveground tanks, warehouses, other plant buildings, loading and unloading facilities or nearest line of adjoining property that can be built on by a distance of at least 25 feet (7620 mm). Vapor-processing equipment shall be protected from physical damage by remote location, guardrails, curbs or fencing.

7904.5.2.9 Switch loading. Tanks which have previously contained Class I liquids shall not be loaded with Class II or III liquids until such tanks and all piping, pumps, hoses and meters connected thereto have been completely drained and flushed.

7904.5.2.10 Electrical. Wiring and electrical equipment located within 25 feet (7620 mm) of any portion of the loading rack shall be designed, operated and installed such that it does not create an ignition hazard.

7904.5.3 Tank Car Loading Racks.

7904.5.3.1 Construction. Construction shall be in accordance with Section 7904.5.2.1.

7904.5.3.2 Location. Location shall be in accordance with Section 7904.5.2.2.

7904.5.3.3 Static protection. Where the resistance of a tank car to ground through the rails is 25 ohms or greater, bonding shall be provided in accordance with Section 7904.5.2.3.

7904.5.3.4 Stray current protection. Tank car loading facilities where Class I, II or III-A liquids are loaded or unloaded through open domes shall be protected against stray currents by permanently bonding the pipe to at least one rail and to the rack structure. Multiple pipes entering the rack area shall be permanently electrically bonded together. In areas where excessive stray currents are known to exist, all pipes entering the rack area shall be provided with insulating sections to electrically isolate the rack piping from the pipe lines.

7904.5.3.5 Smoking. Smoking controls shall be in accordance with Section 7904.5.2.5.

7904.5.3.6 Security. Loading racks or properties on which a loading rack is located shall be surrounded by a fence not less than 5 feet (1524 mm) in height, constructed of wire mesh, solid metal sheathing or masonry. Tank cars shall not be loaded or unloaded unless such tank cars are entirely within such enclosure.

EXCEPTION: Existing installations where adequate public safety exists due to isolation, natural barriers or other factors as determined by the chief.

7904.5.3.7 Switch loading. Switch loading shall be in accordance with Section 7904.5.2.9.

7904.5.4 Liquid transfer.

7904.5.4.1 Transfer apparatus. Transfer apparatus shall be of an approved type.

7904.5.4.2 Destination of liquids off loaded from tank vehicles and tank cars.

7904.5.4.2.1 General. Class I, II or III liquids shall be transferred from a tank vehicle or tank car only into an approved atmospheric tank or approved portable tank, except as provided in Sections 7904.5.4.2.2 through 7904.5.4.6.

7904.5.4.2.2 Marine craft and special equipment. Liquids intended for use as motor fuels are allowed to be transferred from tank vehicles into the fuel tanks of marine craft and special equipment under the following conditions and when approved by the chief, and when:

1. The tank vehicle's specific function is that of supplying fuel to fuel tanks and each premises shall require a separate permit issued in accordance with Section 105,

2. The operation shall be performed only where the general public has no access or where there is no unusual exposure to life and property,

3. The dispensing line shall not exceed 50 feet (15 240 mm) in length, and

4. The dispensing nozzle is approved.

7904.5.4.2.2.1 Vehicle fueling. When approved by the chief, dispensing of motor vehicle fuel from tank vehicles into the fuel tanks of motor vehicles is allowed in accordance with Article 52 and Sections 7904.2 and 7904.5.4.2.2.

7904.5.4.2.3 Emergency refueling. When approved by the chief, dispensing of motor vehicle fuel from tank vehicles into the fuel tanks of motor vehicles is allowed during emergencies. Dispensing from tank vehicles shall be in accordance with Sections 7904.2.8 and 7904.6.

7904.5.4.2.4 Aircraft fueling. Transfer of liquids from tank vehicles to the fuel tanks of aircraft is allowed in accordance with Section 2402.

7904.5.4.2.5 Fueling of vehicles at farms, construction sites and similar areas. Transfer of liquids from tank vehicles to motor vehicles for private use on farms and rural areas and at construction sites, earth moving projects, gravel pits and borrow pits is allowed in accordance with Section 7904.2.8.

7904.5.4.2.6 Disabled vehicles. When a tank vehicle or tank is disabled through accident or mechanical failure and it becomes necessary to remove the cargo at that location, such cargo is allowed to be transferred to another tank vehicle or tank car.

7904.5.4.3 Time limit for unloading. Tank vehicles and tank cars shall be unloaded as soon as possible after arrival at point of delivery and shall not be used as storage tanks. Tank cars shall be unloaded only on private sidings or railroad siding facilities equipped for transferring the liquid between tank cars and permanent storage tanks. Unless otherwise approved by the chief, a tank car shall not be

allowed to remain on a siding at the point of delivery for more than 24 hours while connected for transfer operations.

7904.5.4.4 Unloading inside buildings. Tank vehicles or tank cars shall not be located inside of a building while unloading Class I, II or III-A liquids, unless approved by the chief.

EXCEPTION: Tank vehicles are allowed under canopies of automotive motor vehicle fuel-dispensing stations.

7904.5.4.5 Vehicle motor shut-down. See Section 7904.6.3.3.

7904.5.4.6 Attendant required. The operator or other competent person shall be in attendance at all times while a tank vehicle or tank car is discharging cargo. When practical, the tank vehicle or tank car shall be positioned such that the operating controls and the discharging end of the hoses are both in view of the operator or other competent person.

7904.5.4.7 Chock blocks. At least two chock blocks not less than 5 inches by 5 inches by 12 inches (127 mm by 127 mm by 304.8 mm) in size and dished to fit the contour of tires shall be used during unloading operations of tank vehicles.

7904.6 Tank Vehicles and Tank Vehicle Operation.

7904.6.1 General. Tank vehicles shall be designed, constructed, equipped and maintained in accordance with U.F.C. Standard 79-4 and Section 7904.6.

7904.6.2 Full trailers and semitrailers.

7904.6.2.1 Attachments. Trailers shall be firmly and securely attached to the vehicle drawing them in a manner conforming with accepted engineering practice.

7904.6.2.2 Brakes. Full trailers and semitrailers shall be equipped with reliable brakes on all wheels, and adequate provisions shall be made for their efficient operation from the driver's seat of the vehicle drawing the trailer or semitrailer.

7904.6.2.3 Trailer connections. Trailer connections shall prevent the towed vehicle from whipping or swerving from side to side dangerously or unreasonably and shall cause the trailer to follow substantially in the path of the towing vehicle.

7904.6.3 Operation of tank vehicles.

7904.6.3.1 Vehicle maintenance. Tank vehicles shall not be operated unless they are in proper repair and free of accumulation of grease, oil or other flammables, and leaks.

7904.6.3.2 Leaving vehicle unattended. The driver, operator or attendant of a tank vehicle shall not leave the vehicle while it is being filled or discharged. The delivery hose, when attached to a tank vehicle, shall be considered to be a part of the tank vehicle.

7904.6.3.3 Vehicle motor shutdown. Motors of tank vehicles or tractors shall be shut down during the making or breaking of hose connections. If loading or unloading is performed without the use of a power pump, the tank vehicles or tractor motor shall be shut down throughout such operations.

7904.6.3.4 Bonding. Bonding shall be in accordance with Section 7904.5.2.3.

7904.6.3.5 Outage. A cargo tank or compartment thereof used for the transportation of flammable or combustible liquids shall not be loaded to absolute capacity. The vacant space in a cargo tank or compartment thereof used in the transportation of flammable or combustible liquids shall not be less than 1 percent. Sufficient space shall be left vacant to prevent leakage from or distortion of such tank or compartment by expansion of the contents due to rise in temperature in transit.

7904.6.3.6 Overfill protection. The driver, operator or attendant of a tank vehicle shall, before making delivery to a tank, determine the unfilled capacity of such tank by a suitable gaging device. To prevent overfilling, the driver, operator or attendant shall not deliver in excess of that amount.

7904.6.3.7 Securing hatches. During loading, hatch covers shall be secured on all but the receiving compartments.

7904.6.3.8 Simultaneous delivery. Simultaneous delivery to underground tanks from two or more discharge hoses shall be made by means of mechanically tight connections between the hose and fill pipe.

7904.6.3.9 Covers closed in transit. Dome covers shall be closed and latched while the tank vehicle is in transit.

7904.6.3.10 Liquid temperature. Materials shall not be loaded into or transported in a tank vehicle at a temperature above the material's ignition temperature unless safeguarded in an approved manner.

7904.6.3.11 Low vapor-pressure liquids. Flammable and combustible liquids with a vapor pressure of 40 psi (275.8 kPa) absolute or less at 100°F. (37.8°C.) shall be loaded into cargo tanks designed and constructed in accordance with Section 7904.6.1.

7904.6.3.12 Bonding of fill stem. Cargo tanks shall be bonded to the fill stem or some part of the rack structure which is electrically interconnected with the fill-stem piping.

EXCEPTIONS:
1. Tank vehicles used for asphalt.
2. Tank vehicles loading flammable or combustible liquids through bottom connections.
3. Tank vehicles used exclusively for transporting Class III liquids when loaded at locations where Class I and II liquids are not handled.

7904.6.3.13 Bonding to underground tanks. An external bond-wire connection or bond-wire integral with a hose shall be provided for the transferring of flammable liquids through open connections into underground tanks.

7904.6.4 Smoking. Smoking by tank vehicle drivers, helpers or other personnel is prohibited while they are driving, making deliveries, filling or making repairs to tank vehicles.

7904.6.5 Parking.

7904.6.5.1 General. Parking of tank vehicles shall be in accordance with Section 7904.6.5.

EXCEPTION: In cases of accident, breakdown or other emergencies, tank vehicles are allowed to be parked and left unattended at any location while the operator is obtaining assistance.

7904.6.5.2 Unattended parking.

7904.6.5.2.1 Parking near residential, educational and institutional occupancies and other high risk areas. Tank vehicles shall not be left unattended at any time on residential streets, or within 500 feet (152.4 m) of a residential area, apartment or hotel complex, educational facility, hospital, or care facility. Tank vehicles shall not be left unattended at any other place that would, in the opinion of the chief, present an extreme life hazard.

7904.6.5.2.2 Parking on thoroughfares. Tank vehicles shall not be left unattended on a street, highway, avenue or alley.

EXCEPTIONS: 1. The necessary absence in connection with loading or unloading the vehicle. During actual fuel transfer, Section 7904.6.3.2 shall apply. The vehicle location shall be in accordance with Section 7904.6.5.2.1.
2. Stops for meals during the day or night, if the street is well lighted at the point of parking. The vehicle location shall be in accordance with Section 7904.6.5.2.1.

7904.6.5.2.3 Durations exceeding one hour. Tank vehicles parked at any one point for longer than one hour shall be located off of streets, highways, avenues or alleys, and

1. Inside of a bulk plant and either 25 feet (7620 mm) or more from the nearest property line or within a building approved for such use, or

2. At other approved locations not less than 50 feet (15 240 mm) from buildings other than those approved for the storage or servicing of such vehicles.

7904.6.6 Garaging. Tank vehicles shall not be parked or garaged in buildings other than those specifically approved for such use by the chief.

7904.6.7 Fire protection. Tank vehicles shall be equipped with a fire extinguisher having a minimum rating of 2-A, 20-B:C.

During unloading of the tank vehicle, the fire extinguisher shall be out of the carrying device on the vehicle and shall be 15 feet (4572 mm) or more from the unloading valves.

7904.7 Refineries.

7904.7.1 General. Plants and portions of plants in which flammable liquids are produced on a commercial scale from crude petroleum, natural gasoline or other hydrocarbon source shall be in accordance with Section 7904.7.

7904.7.2 Corrosion protection. Aboveground tanks and piping systems shall be protected against corrosion. See Article 90, Standard a.3.6.

7904.7.3 Inspection, repair, alteration or reconstruction of tanks and piping. The inspection, repair, alteration or reconstruction, including welding, cutting and hot tapping, of aboveground storage tanks and piping that have been placed in service shall be in accordance with nationally recognized standards. See Article 90, Standards a.3.7, a.3.14 and a.3.18.

7904.7.4 Cleaning of tanks. The safe entry and cleaning of petroleum storage tanks shall be conducted in accordance with nationally recognized standards and practices. See Article 90, Standard a.3.15.

7904.7.5 Asphalt products and residua derived from crude petroleum products. When asphalt products and residua derived from crude petroleum products are stored in heated tanks at refineries and bulk storage facilities in tank vehicles, such products shall be handled in accordance with nationally recognized standards. See Article 90, Standard a.3.16.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-7904, filed 12/21/94, effective 6/30/95.]

WAC 51-34-8000 Article 80—Hazardous materials.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-8000, filed 12/21/94, effective 6/30/95.]

WAC 51-34-8001 Section 8001—General.

8001.1 Scope.

8001.1.1 General. Prevention, control and mitigation of dangerous conditions related to storage, dispensing, use and handling of hazardous materials and information needed by emergency response personnel shall be in accordance with Article 80.

EXCEPTIONS: 1. Off-site hazardous materials transportation in accordance with DOT requirements.
2. The quantities of alcoholic beverages, medicines, foodstuffs and cosmetics, containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, in retail sales occupancies are unlimited when packaged in individual containers not exceeding 4 liters.

8001.1.2 Material classification. Hazardous materials are those chemicals or substances defined as such in Article 2. See Appendix VI-A for the classification of hazard categories and hazard evaluations.

The classification system referenced in Section 8002 shall apply to all hazardous materials, including those materials regulated elsewhere in this code.

Mixtures shall be classified in accordance with hazards of the mixture as a whole. Mixtures shall be classified by a qualified organization, individual or testing laboratory approved by the chief.

8001.1.3 Application. Section 8001 shall apply to all hazardous materials, including those materials regulated elsewhere in this code, except that when specific requirements are provided in other articles, those specific requirements shall apply.

When a material has multiple hazards, all hazards shall be addressed.

The provisions of Article 80 related to health hazards as classified in Section 8002 are waived when the chief has determined that such enforcement is preempted by other codes, statutes or ordinances. The details of any action granting such a waiver shall be recorded and entered in the files of the code enforcement agency.

8001.1.4 Existing buildings. For existing buildings, see Section 102.

8001.1.5 Retail and wholesale storage and display. For retail and wholesale storage and display of nonflammable solid and nonflammable or noncombustible liquid hazardous materials in Group M retail sales occupancies, see Section 8001.12.

8001.2 Definitions.

8001.2.1 General. For definitions of BARRICADE; BULK OXYGEN SYSTEM; CARCINOGEN; CEILING LIMIT, CHEMICAL, C.F.R.; CHEMICAL NAME; COMMON RADIATION SOURCE MATERIAL; COMPRESSED GAS; COMPRESSED GAS CONTAINER; COMPRESSED GAS SYSTEM; CONTINUOUS GAS-DETECTION SYSTEM; CONTROL AREA; CYLINDER; CORROSIVE; DEFLAGRATION; DETACHED STORAGE; DETONATION; DOT; EXCESS FLOW CONTROL; EXCESS FLOW VALVE; EXPLOSION; EXPLOSIVE; FISSILE MATERIAL; FLAMMABLE GAS; FLAMMABLE LIQUEFIED GAS; FLAMMABLE SOLID; HANDLING; HAZARDOUS MATERIAL; HEALTH HAZARD; HIGHLY TOXIC MATERIAL; HIGHLY VOLATILE LIQUID; IDLH; INERT GAS; IRRITANT; MATERIAL SAFETY DATA SHEET; NESTING; NORMAL TEMPERATURE AND PRESSURE (NTP); ORGANIC PEROXIDE; OSHA; OXIDIZER; PERMISSIBLE EXPOSURE LIMIT (PEL); PEROXIDE-FORMING CHEMICAL; PHYSICAL HAZARD; PORTABLE TANKS; PRIMARY CONTAINMENT; PROPRIETARY INFORMATION; PYROPHORIC; REDUCED FLOW VALVE; RETAIL SALES OCCUPANCY; SCAVENGED GAS; SECONDARY CONTAINMENT; SEGREGATED; SENSITIZER; SEPARATE GAS STORAGE ROOM; SIMPLE ASPHYXIANT GAS; STATIONARY TANK; STORAGE FACILITY; TOXIC MATERIAL; UNAUTHORIZED DISCHARGE; UNSTABLE MATERIAL, UNSTABLE (reactive) LIQUID; USE; USE, CLOSED SYSTEM; USE, OPEN SYSTEM; and WATER-REACTIVE MATERIAL, see Article 2.

8001.2.2 Limited application. For the purpose of Article 80, certain terms are defined as follows:

CONTAINER is any vessel of 60 United States gallons (227.1 L) or less capacity used for transporting or storing hazardous materials.

OUTDOOR AREA is a single, contiguous property exterior to buildings or without buildings thereon which is under the ownership or control of a single person. See also definition of PERSON in Section 217.

8001.3 Permits.

8001.3.1 General. Permits are required to store, dispense, use or handle hazardous material in excess of quantities specified in Section 105, Permit h.1.

A permit is required when a material is classified as having more than one hazard category if the quantity limits are exceeded in any category.

Permits are required to install, repair, abandon, remove, place temporarily out of service, close or substantially modify a storage facility or other area regulated by Article 80. See also Section 8001.11.

EXCEPTIONS:
1. Routine maintenance.
2. For emergency repair work performed on an emergency basis, application for permit shall be made within two working days of commencement of work.

Permittee shall apply for approval to close storage, use or handling facilities at least 30 days prior to the termination of the storage, use or handling of hazardous materials. Such application shall include any change or alteration of the facility closure plan filed pursuant to Section 8001.11. This 30-day period may be waived by the chief if there are special circumstances requiring such waiver.

8001.3.2 Hazardous materials management plan. When required by the chief, each application for a permit shall include a hazardous materials management plan (HMMP). The location of the HMMP shall be posted adjacent to permits when an HMMP is provided. The HMMP shall include a facility site plan designating the following:

1. Storage and use areas,
2. Maximum amount of each material stored or used in each area,
3. Range of container sizes,
4. Locations of emergency isolation and mitigation valves and devices,
5. Product conveying piping containing liquids or gases, other than utility-owned fuel gas lines and low-pressure fuel gas lines, and
6. On and off positions of valves for valves which are of the self-indicating type.

The plans shall be legible and approximately to scale. Separate distribution systems are allowed to be shown on separate pages.

See also Appendix II-E.

EXCEPTION: When an HMMP is required, the applicant may submit the report(s) used for compliance with requirements of 40 CFR "Hazardous Chemical Reporting and Community Right-to-Know Regulations" under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

8001.3.3 Hazardous materials inventory statement. When required by the chief, each application for a permit shall include a hazardous materials inventory statement (HMIS). See also Appendix II-E.

8001.4 Systems, Equipment and Processes.

8001.4.1 General. Containers, cylinders and tanks utilized for storage, dispensing, use or handling of hazardous materials shall be in accordance with Section 8001.4.

8001.4.2 Design and construction of containers, cylinders and tanks. Containers, cylinders and tanks shall be designed and constructed in accordance with nationally recognized standards. See Article 90 and Section 101.3. Containers, cylinders, tanks and other means used for transporting hazardous materials shall be of an approved type.

8001.4.3 Piping, tubing, valves and fittings.

8001.4.3.1 General. Piping, tubing, valves and fittings conveying hazardous materials shall be installed in accordance with approved standards and shall be in accordance with Section 8001.4.3.

8001.4.3.2 Design and construction. Piping, tubing, valves, fittings and related components used for hazardous materials shall be in accordance with the following:

1. Piping, tubing, valves, fittings and related components shall be designed and fabricated from materials compatible with the material to be contained and shall be of adequate strength and durability to withstand the pressure,

structural and seismic stress, and exposure to which they are subject,

2. Piping and tubing shall be identified in accordance with nationally recognized standards (see Article 90, Standard a.2.1) to indicate the material conveyed,

3. Emergency shutoff valves shall be identified and the location shall be clearly visible and indicated by means of a sign, and

4. Backflow-prevention or check valves shall be provided when the backflow of hazardous materials could create a hazardous condition or cause the unauthorized discharge of hazardous materials.

8001.4.3.3 Additional regulations for supply piping for health hazard materials. Supply piping and tubing for gases and liquids having a health hazard ranking of 3 or 4 in accordance with U.F.C. Standard 79-3 shall also be in accordance with the following:

1. Piping and tubing utilized for the transmission of highly toxic or toxic material shall have welded or brazed connections throughout unless an exhausted enclosure is provided if the material is a gas, or the piping is provided with a receptor for containment if the material is a liquid,

EXCEPTION: Nonmetallic piping with approved connections.

2. Piping and tubing shall not be located within exit corridors, within any portion of an exit required to be enclosed in fire-resistive construction, or above areas not classified as Group H Occupancies,

EXCEPTION: Piping and tubing within the space defined by the walls of exit corridors and floor or roof above or in concealed space above other occupancies when installed in accordance with the Building Code as required for Group H, Division 6 Occupancies. See U.B.C. Section 307.11.6.2.

3. Where gases or liquids are carried in pressurized piping above 15 psig (103.4 kPa), excess flow control shall be provided. Where the piping originates from within a hazardous material storage room or area, the excess flow control shall be located within the storage room or area. Where the piping originates from a bulk source, the excess flow control shall be located as close to the bulk source as practical, and

4. Readily accessible manual or automatic remotely activated fail-safe emergency shutoff valves shall be installed on supply piping and tubing at the following locations:

4.1 The point of use, and

4.2 The tank, cylinder or bulk source.

8001.4.3.4 Flammable, oxidizing and pyrophoric gases. Low melting point materials, such as aluminum, copper and some brass alloys or materials which soften on fire exposure, such as nonmetallic materials, or nonductile materials, such as cast iron, shall not be used for piping, valves or fittings conveying flammable, pyrophoric or oxidizing gases unless they are in accordance with one of the following:

1. Suitably protected against fire exposure by fire-resistive construction, gas cabinets, automatic fire sprinklers or other approved methods,

2. Located so that any release resulting from failure will not unduly expose persons, buildings or structures, or

3. Located where leakage can readily be controlled by operation of an accessible, remotely located valve or valves.

8001.4.4 Suitability of equipment, machinery and processes. Equipment, machinery and processes utilized for dispensing, use or handling of hazardous materials shall be approved, listed, or designed and constructed in accordance with approved standards for the intended use. Such equipment, machinery and processes shall be maintained in an operable condition.

8001.4.5 Installation of tanks.

8001.4.5.1 Underground tanks.

8001.4.5.1.1 General. Underground tanks used for the storage of liquid hazardous materials shall be located and protected in accordance with Section 7902.6.11.

8001.4.5.1.2 Secondary containment. Secondary containment shall be provided for new installations of underground tanks.

8001.4.5.2 Aboveground tanks. Aboveground stationary tanks used for the storage of hazardous materials shall be located and protected in accordance with the requirements for outdoor storage of the particular material involved and shall be marked as required by Section 8003.1.2.

8001.4.6 Empty containers and tanks. Empty containers and tanks previously used for the storage of hazardous materials shall be free from residual material and vapor as defined by DOT, the Resource Conservation and Recovery Act (RCRA) or other regulating authority or maintained as specified for the storage of the hazardous material.

8001.4.7 Maintenance.

8001.4.7.1 General. Defective containers, cylinders and tanks shall be removed from service, repaired or disposed of in an approved manner. Equipment, machinery and processes found to be defective shall be replaced, repaired or removed from service. See also Section 8001.4.4.

8001.4.7.2 Tanks out-of-service for 90 days. Stationary tanks not used for a period of 90 days shall be properly safeguarded or removed in a manner approved by the chief. Such tanks shall have the fill line, gauge opening and pump connection secured against tampering. Vent lines shall be properly maintained.

Tanks which are to be placed back in service shall be tested in a manner approved by the chief.

8001.4.7.3 Defective containers and tanks. Defective containers and tanks shall be removed from service, repaired or disposed of in an approved manner.

8001.5 Release of Hazardous Materials.

8001.5.1 General. Hazardous materials shall not be released into a sewer, storm drain, ditch, drainage canal, lake, river or tidal waterway, or upon the ground, sidewalk, street, highway or into the atmosphere.

EXCEPTIONS: 1. Pesticide products and materials intended for use in weed abatement, erosion control, soil amendment or similar applications when applied in accordance with the

manufacturer's instructions, label directions and in accordance with nationally recognized standards.
2. Materials released in accordance with federal, state or local governing regulations or permits of the jurisdictional Air Quality Management Board with a National Pollutant Discharge Elimination System Permit, with waste discharge requirements established by the jurisdictional Water Quality Control Board or with local sewer pretreatment requirements for publicly owned treatment works.

8001.5.2 Unauthorized discharges.

8001.5.2.1 Records. Accurate records shall be kept of the unauthorized discharge of hazardous materials by the permittee.

8001.5.2.2 Notification. The chief shall be notified immediately when an unauthorized discharge becomes reportable under state, federal or local regulations.

8001.5.2.3 Preparation. Provisions shall be made for controlling and mitigating unauthorized discharges.

8001.5.2.4 Control. When an unauthorized discharge due to primary container failure is discovered, the involved primary container shall be repaired or removed from service.

8001.5.2.5 Responsibility for cleanup. The person, firm or corporation responsible for an unauthorized discharge shall institute and complete all actions necessary to remedy the effects of such unauthorized discharge, whether sudden or gradual, at no cost to the jurisdiction.

When deemed necessary by the chief, cleanup may be initiated by the fire department or by an authorized individual or firm. Costs associated with such cleanup shall be borne by the owner, operator or other person responsible for the unauthorized discharge.

8001.6 Material Safety Data Sheets. Material safety data sheets (MSDS) shall be readily available on the premises for hazardous materials regulated by Article 80. See also Section 8001.3.2.

8001.7 Identification Signs. Visible hazard identification signs as specified in U.F.C. Standard 79-3 shall be placed at entrances to locations where hazardous materials are stored, dispensed, used or handled in quantities requiring a permit. Signs shall be provided at specific entrances designated by the chief.

EXCEPTION: The chief may waive this requirement in special cases when consistent with safety if the owner or operator has submitted a hazardous materials management plan and hazardous materials inventory statement. See Appendix II-E and Sections 8001.3.2 and 8001.3.3.

Individual containers, cartons or packages shall be conspicuously marked or labeled in accordance with nationally recognized standards. See also Section 8003.1.2.

Rooms or cabinets containing compressed gases shall be conspicuously labeled COMPRESSED GAS.

8001.8 Construction Requirements.

8001.8.1 General. Buildings, or portions thereof, in which hazardous materials are stored, handled or used shall be constructed in accordance with the Building Code.

8001.8.2 Control areas.

8001.8.2.1 Construction requirements. Control areas shall be separated from each other by not less than a one-hour fire-resistive occupancy separation.

8001.8.2.2 Number. The number of control areas in buildings or portions of buildings used for retail or wholesale sales shall not exceed two. The number of control areas in buildings with other uses shall not exceed four.

8001.9 General Safety Precautions.

8001.9.1 Personnel training and written procedures.

8001.9.1.1 General. Persons responsible for the operation of areas in which hazardous materials are stored, dispensed, handled or used shall be familiar with the chemical nature of the materials and the appropriate mitigating actions necessary in the event of fire, leak or spill.

8001.9.1.2 Fire department liaison. Responsible persons shall be designated and trained to be liaison personnel for the fire department. These persons shall aid the fire department in preplanning emergency responses and identification of the locations where hazardous materials are located and shall have access to material safety data sheets and be knowledgeable in the site emergency response procedures.

8001.9.2 Security. The storage, dispensing, use and handling areas shall be secured against unauthorized entry and safeguarded with such protective facilities as public safety requires.

8001.9.3 Protection from vehicles. Guard posts or other approved means shall be provided to protect storage tanks and connected piping, valves and fittings; dispensing areas; and use areas subject to vehicular damage. When guard posts are installed, the posts shall be:

1. Constructed of steel not less than 4 inches (101.6 mm) in diameter and concrete filled,

2. Spaced not more than 4 feet (1219 mm) between posts on center,

3. Set not less than 3 feet (914 mm) deep in a concrete footing of not less than a 15-inch (381 mm) diameter,

4. Set with the top of the posts not less than 3 feet (914 mm) above ground, and

5. Located not less than 5 feet (1524 mm) from the tank.

8001.9.4 Electrical wiring and equipment. Electrical wiring and equipment shall be installed in accordance with the Electrical Code.

8001.9.5 Static accumulation. When processes or conditions exist where a flammable mixture could be ignited by static electricity, means shall be provided to prevent the accumulation of a static charge.

8001.9.6 Protection from light. Materials which are sensitive to light shall be stored in containers designed to protect them from such exposure.

8001.9.7 Shock padding. Materials which are shock sensitive shall be padded, suspended or otherwise protected against accidental dislodgment and dislodgment during

seismic activity. For seismic requirements and the seismic zone in which the material is located, see the Building Code.

8001.9.8 Separation of incompatible materials. Incompatible materials in storage and storage of materials incompatible with materials in use shall be separated when the stored materials are in containers having a capacity of more than 5 pounds (2.268 kg) or ½ gallon (1.89 L). Separation shall be accomplished by:

1. Segregating incompatible materials storage by a distance of not less than 20 feet (6096 mm),

2. Isolating incompatible materials storage by a noncombustible partition extending not less than 18 inches (457.2 mm) above and to the sides of the stored material,

3. Storing liquid and solid materials in hazardous materials storage cabinets (see Section 8003.1.10), or

4. Storing compressed gases in gas cabinets or exhausted enclosures in accordance with Sections 8003.3.1.3.2 and 8003.3.1.3.3.

Materials which are incompatible shall not be stored within the same cabinet or exhausted enclosure.

8001.10 Handling and Transportation.

8001.10.1 General. Handling and transportation of hazardous materials in exit corridors or exit enclosures shall be in accordance with Section 8001.10. See also Section 8001.4.

Hazardous materials gas containers, cylinders and tanks in transit shall have their protective caps in place. Containers, cylinders and tanks of highly toxic or toxic compressed gases shall have their valve outlets capped or plugged with an approved closure device. See also Sections 7401.7 and 7403.3.

8001.10.2 Required use of carts and trucks. Liquids in containers exceeding 5 gallons (18.9 L) in an exit corridor or exit enclosure shall be transported on a cart or truck. Containers of hazardous materials having a hazard ranking of 3 or 4 in accordance with U.F.C. Standard 79-3 transported within exit corridors or exit enclosures shall be on a cart or truck. When carts and trucks are required for transporting hazardous materials, they shall be in accordance with Section 8001.10.3.

EXCEPTIONS:
1. Two hazardous materials liquid containers, which are hand carried in acceptable safety carriers.
2. Single drums not exceeding 55 gallons (208.2 L), which are transported by suitable drum trucks.
3. Containers and cylinders of compressed gases, which are transported by approved hand trucks, and containers and cylinders not exceeding 25 pounds (11.3 kg), which are hand carried.
4. Solid hazardous materials not exceeding 100 pounds (45.4 kg), which are transported by approved hand trucks, and a single container not exceeding 50 pounds (22.7 kg), which is hand carried.

8001.10.3 Carts and trucks.

8001.10.3.1 General. Carts and trucks required by Section 8001.10.2 to be used to transport hazardous materials shall be in accordance with Section 8001.10.3.

8001.10.3.2 Design. Carts and trucks used to transport hazardous materials shall be designed to provide a stable base for the commodities to be transported and shall have a means of restraining containers to prevent accidental dislodgment. Compressed gas cylinders placed on carts and trucks shall be individually restrained.

8001.10.3.3 Speed-control devices. Carts and trucks shall be provided with a device which will enable the operator to safely control movement by providing stops or speed-reduction devices.

8001.10.3.4 Construction. Construction materials for hazardous materials carts or trucks shall be compatible with the material transported. The cart or truck shall be of substantial construction.

8001.10.3.5 Spill control. Carts and trucks transporting liquids shall be capable of containing a spill from the largest single container transported.

8001.10.3.6 Attendance. Carts and trucks used to transport materials shall not obstruct or be left unattended within any part of an exit.

8001.10.3.7 Incompatible materials. Incompatible materials shall not be transported on the same cart or truck.

8001.11 Facility Closure.

8001.11.1 Temporarily out-of-service facilities. Facilities which are temporarily out of service shall continue to maintain a permit and be monitored and inspected.

8001.11.2 Permanently out-of-service facilities. Facilities for which a permit is not kept current or is not monitored and inspected on a regular basis shall be deemed to be permanently out of service and shall be closed in accordance with Section 8001.11.3.

8001.11.3 Plan. The permit holder or applicant shall submit a plan to the fire department to terminate storage, dispensing, handling or use of hazardous materials at least 30 days prior to facility closure. The plan shall demonstrate that hazardous materials which were stored, dispensed, handled or used in the facility have been transported, disposed of or reused in a manner that eliminates the need for further maintenance and any threat to public health and safety. Such plan shall be submitted in accordance with Section 8001.3.1.

8001.12 Retail and Wholesale Storage and Display.

8001.12.1 General. The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials within a single control area of a Group M retail or wholesale sales occupancy is allowed to exceed the exempt amounts specified in Section 8001.13 when in accordance with Section 8001.12. The maximum quantity allowed within a single control area of a retail or wholesale sales occupancy shall be the greater of the exempt amount derived from Section 8001.13 or the amount derived from the formula:

$$E_E = E \times R \times A$$

For SI:
$$E_E = 10.8 \times E \times R \times A$$

WHERE:

E_E = exempt amount allowed in a single control area of a retail or wholesale sales occupancy.
E = exempt amount specified in Section 8001.13.
R = multiplier for retail or wholesale sales occupancies from Table 8001.12-A.
A = area of the hazardous material retail display or storage in square feet (m^2).

8001.12.2 Maximum area. The maximum aggregate floor area "A" for hazardous material retail or wholesale display or storage over which the multiplier is applied shall not exceed 1,500 square feet (139.4 m²) per control area.

8001.12.3 Storage and display areas.

8001.12.3.1 General. The area of storage or display shall also be in accordance with Section 8001.12.3.

8001.12.3.2 Density. Display of solids shall not exceed 200 pounds per square foot (976.4 kg/m²) of floor area actually occupied by solid merchandise. Display of liquids shall not exceed 20 gallons per square foot (76 L/m²) of floor area actually occupied by liquid merchandise.

8001.12.3.3 Height. Display height shall not exceed 6 feet (1829 mm).

8001.12.3.4 Container location. Individual containers less than 5 gallons (19 L) or less than 25 pounds (11.3 kg) shall be stored on pallets, racks or shelves.

8001.12.3.5 Racks and shelves. Storage racks and shelves shall be in accordance with Section 8003.1.4.

8001.12.3.6 Container type. Containers shall be approved for the use intended.

8001.12.3.7 Container size. Individual containers shall not exceed 100 pounds (45.4 kg) or a 5-gallon (19 L) capacity.

8001.12.3.8 Incompatible materials. Incompatible materials shall be separated in accordance with Section 8001.9.8.

8001.12.3.9 Floors. Floors shall be in accordance with Section 8003.1.18.

8001.12.3.10 Aisles. Aisles 4 feet (1219 mm) in width shall be maintained on three sides of the display area.

8001.12.3.11 Signs. Hazard identification signs shall be provided in accordance with Section 8001.7.

8001.13 Exempt Amounts.

8001.13.1 General. Exempt amounts shall be as specified in Section 8001.13.2 and Tables 8001.13-A through 8001.13-D. Storage, dispensing, use and handling of hazardous materials in quantities exceeding exempt amounts shall be in accordance with Sections 8001, 8003 and 8004.

Storage, dispensing, use and handling of hazardous materials in quantities not exceeding exempt amounts shall be in accordance with Section 8001.

Where exempt amounts are indicated in pounds (kilograms), a conversion of 10 pounds per gallon (1.2 kg/L) shall be used.

For retail and wholesale display, see Section 8001.12.

8001.13.2 Special limitations for indoor storage and use by occupancy.

8001.13.2.1 General. Quantities of hazardous materials shall be limited within occupancies in accordance with Sections 8001.13.2 and 8001.13.3.

8001.13.2.2 Group A Occupancies.

8001.13.2.2.1 Toxic and highly toxic compressed gases. Toxic and highly toxic compressed gases shall not be stored or used within Group A Occupancies.

EXCEPTION: Cylinders not exceeding 20 cubic feet (0.57 m³) at NTP are allowed within gas cabinets or fume hoods.

8001.13.2.2.2 Liquid and solid oxidizers. Class 4 liquid and solid oxidizers shall not be stored or used in Group A Occupancies.

EXCEPTION: Class 4 liquid and solid oxidizers are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.2.3 Organic peroxides. Unclassified detonatable and Class I organic peroxides shall not be stored or used in Group A Occupancies.

EXCEPTION: Unclassified detonatable and Class I organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.2.4 Unstable (reactive) materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used in Group A Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.2.5 Flammable and oxidizing gases. Except for cylinders not exceeding 250 cubic feet (7.1 m³) at NTP used for maintenance purposes, patient care or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group A Occupancies.

The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the exempt amounts listed in Table 8001.13-A.

8001.13.2.3 Groups B, F, M and S Occupancies.

8001.13.2.3.1 Toxic and highly toxic compressed gases. Toxic and highly toxic compressed gases shall not be stored or used in offices, retail sales or classroom portions of Group B, F, M or S Occupancies.

EXCEPTION: When within classrooms of Group B Occupancies, cylinders not exceeding 20 cubic feet (0.57 m³) at NTP are allowed in gas cabinets or fume hoods.

8001.13.2.3.2 Liquid and solid oxidizers. Class 4 liquid and solid oxidizers shall not be stored or used in offices, retail sales or classroom portions of Group B, F, M or S Occupancies.

EXCEPTION: When within classrooms of Groups B, F and M Occupancies, Class 4 liquid and solid oxidizers are allowed when stored in hazardous materials storage cabinets. Hazardous material storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.3.3 Organic peroxides. Unclassified detonatable and Class I organic peroxides shall not be stored or used in

offices, classrooms and retail sales portions or Group B, F, M or S Occupancies.

EXCEPTION: When within classrooms of Groups B, F and M Occupancies, undetonatable and Class I organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.3.4 Unstable (reactive) materials.

8001.13.2.3.4.1 Offices. Class 3 and 4 unstable (reactive) materials shall not be stored or used in offices of Group B, F, M or S Occupancies.

8001.13.2.3.4.2 Classrooms. Class 3 and 4 unstable (reactive) materials shall not be stored or used in classrooms of Group B, F or M Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous material storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.3.4.3 Retail sales. Class 4 unstable (reactive) materials shall not be stored or used in retail sales portions of Group M Occupancies.

8001.13.2.3.5 Flammable and oxidizing gases. Except for cylinders not exceeding 250 cubic feet (7.08 m^3) at NTP used for maintenance purposes, patient care or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group B, F, M or S Occupancies.

The aggregate quantities of gases used for maintenance purposes, patient care and operation of equipment shall not exceed the exempt amounts listed in Table 8001.13-A. Medical gas system supply cylinders shall be located in medical gas storage rooms in gas cabinets as set forth in Section 7404.2.

8001.13.2.4 Group E Occupancies.

8001.13.2.4.1 Toxic and highly toxic compressed gases. Toxic and highly toxic compressed gases shall not be stored or used in Group E Occupancies.

EXCEPTION: Cylinders not exceeding 20 cubic feet (0.57 m^3) at NTP are allowed within gas cabinets or fume hoods.

8001.13.2.4.2 Liquid and solid oxidizers. Class 4 liquid and solid oxidizers shall not be stored or used in Group E Occupancies.

EXCEPTION: Class 4 liquid and solid oxidizers are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.4.3 Organic peroxides. Unclassified detonatable and Class I organic peroxides shall not be stored or used in Group E Occupancies.

EXCEPTION: Unclassified detonatable and Class I organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.4.4 Unstable (reactive) materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used in Group E Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.4.5 Flammable and oxidizing gases. Except for cylinders not exceeding 250 cubic feet (7.08 m^3) at NTP used for maintenance purposes or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group E Occupancies.

The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the exempt amounts listed in Table 8001.13-A.

8001.13.2.5 Group I Occupancies.

8001.13.2.5.1 Toxic and highly toxic compressed gases. Toxic and highly toxic compressed gases shall not be stored or used within Group I Occupancies.

EXCEPTION: Cylinders not exceeding 20 cubic feet (0.57 m^3) at NTP are allowed within gas cabinets or fume hoods in quantities up to the exempt amount.

8001.13.2.5.2 Liquid and solid oxidizers.

8001.13.2.5.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used in Group I Occupancies.

EXCEPTION: Class 4 liquid and solid oxidizers are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.5.2.2 Class 3. A maximum of 200 pounds (90.7 kg) of solid or 2 gallons (7.57 L) of liquid Class 3 oxidizer is allowed in Group I Occupancies when such materials are necessary for maintenance purposes or operation of equipment. The oxidizers shall be stored in approved containers and in a manner approved by the chief.

8001.13.2.5.3 Organic peroxides. Unclassified detonatable and Class I organic peroxides shall not be stored or used in Group I Occupancies.

EXCEPTION: Unclassified detonatable and Class I organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.5.4 Unstable (reactive) materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used in Group I Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.5.5 Flammable and oxidizing gases. Except for cylinders not exceeding 250 cubic feet (7.08 m^3) at NTP used for maintenance purposes, patient care or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group I Occupancies.

The aggregate quantities of gases used for maintenance purposes, patient care and operation of equipment shall not exceed the exempt amounts listed in Table 8001.13-A. Medical gas system supply cylinders shall be located in medical gas storage rooms or gas cabinets as set forth in Section 7404.2.

8001.13.2.6 Group R Occupancies.

8001.13.2.6.1 Toxic and highly toxic compressed gases. Toxic and highly toxic compressed gases shall not be stored or used in Group R Occupancies.

8001.13.2.6.2 Liquid and solid oxidizers.

8001.13.2.6.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used within Group R Occupancies.

8001.13.2.6.2.2 Class 3. A maximum of 200 pounds (90.7 kg) of solid or 20 gallons (7.57 L) of liquid Class 3 oxidizers is allowed in Group R Occupancies when such materials are necessary for maintenance purposes or operation of equipment. The oxidizers shall be stored in approved containers and in a manner approved by the chief.

8001.13.2.6.3 Organic peroxides. Unclassified detonatable and Class I organic peroxides shall not be stored or used within Group R Occupancies.

8001.13.2.6.4 Unstable (reactive) materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used within Group R Occupancies.

8001.13.2.6.5 Flammable and oxidizing gases. Except for cylinders not exceeding 250 cubic feet (7.08 m^3) at NTP used for maintenance purposes or operation of equipment, flammable and oxidizing gases shall not be stored or used in Group R Occupancies.

The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the exempt amounts listed in Table 8001.13-A.

8001.13.2.7 Group U Occupancies.

8001.13.2.7.1 Toxic and highly toxic compressed gases. Toxic and highly toxic compressed gases shall not be stored or used within Group U Occupancies.

EXCEPTION: Cylinders not exceeding 20 cubic feet (0.57 m^3) at NTP are allowed within gas cabinets or fume hoods.

8001.13.2.7.2 Liquid and solid oxidizers.

8001.13.2.7.2.1 Class 4. Class 4 liquid and solid oxidizers shall not be stored or used in Group U Occupancies.

EXCEPTION: Class 4 liquid and solid oxidizers are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.7.2.2 Class 3. A maximum of 200 pounds (90.7 kg) of solid or 2 gallons (7.57 L) of liquid Class 3 oxidizer is allowed in Group U Occupancies when such materials are necessary for maintenance purposes or operation of equipment. The oxidizers shall be stored in approved containers and in a manner approved by the chief.

8001.13.2.7.3 Organic peroxides. Unclassified detonatable and Class I organic peroxides shall not be stored or used in Group U Occupancies.

EXCEPTION: Unclassified detonatable and Class I organic peroxides are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.2.7.4 Unstable (reactive) materials. Class 3 and 4 unstable (reactive) materials shall not be stored or used in Group U Occupancies.

EXCEPTION: Class 3 and 4 unstable (reactive) materials are allowed when stored within hazardous materials storage cabinets. Hazardous materials storage cabinets shall comply with Section 8003.1.10 and shall not contain other storage.

8001.13.3 Special requirements for toxic liquids. The exempt amount for toxic liquids with vapor pressures in excess of 1 psia (6.89 kPa) at 77°F. (25°C.) shall be the exempt amount listed for highly toxic liquids.

8001.14 Regulations for Specific Hazardous Materials in Quantities not Exceeding Exempt Amounts.

8001.14.1 General. Hazardous materials stored, dispensed, used or handled in quantities not exceeding exempt amounts set forth in Section 8001.13 shall be in accordance with Section 8001.14.

8001.14.2 Flammable gases.

8001.14.2.1 Emergency shutoff. Compressed gas systems conveying flammable gases shall be provided with emergency shutoff capability in accordance with Section 8004.1.14.

8001.14.2.2 Ignition source control. Ignition sources in areas containing flammable gases shall be controlled in accordance with Section 8003.1.3.

NO SMOKING signs shall be posted in areas containing flammable gases in accordance with Section 8003.1.2.

8001.14.2.3 Liquefied flammable gases and flammable gases in solution. Containers of liquefied flammable gases and flammable gases in solution shall be positioned in accordance with Section 8004.1.15.

8001.14.3 Oxidizing gases.

8001.14.3.1 Emergency shutoff. Compresses gas systems conveying oxidizing gases shall be provided with emergency shutoff capability in accordance with Section 8004.1.14.

8001.14.3.2 Ignition source control. Ignition sources in areas containing oxidizing gases shall be controlled in accordance with Section 8003.1.3.

8001.14.4 Pyrophoric gases.

8001.14.4.1 Emergency shutoff. Compressed gas systems conveying pyrophoric gases shall be provided with emergency shutoff capability in accordance with Section 8004.1.14.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-8001, filed 12/21/94, effective 6/30/95.]

WAC 51-34-8003 Section 8003—Storage.

8003.1 General.

8003.1.1 Applicability. Storage of hazardous materials where the aggregate quantity is in excess of the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8001 and 8003.

Storage of hazardous materials where the aggregate quantity does not exceed the exempt amounts set forth in Section 8001.13 shall be in accordance with Section 8001.

For display and storage in retail and wholesale sales occupancies, see Section 8001.12.

Hazardous materials regulated by other articles are not required to be in accordance with Section 8003 unless specifically indicated in Section 8003.

8003.1.2 Signs. In addition to the hazard identification signs required by Section 8001.7, stationary aboveground tanks shall be placarded with hazard identification signs as specified in U.F.C. Standard 79-3 for the specific material contained.

Signs prohibiting smoking shall be provided in storage areas and within 25 feet (7620 mm) of outdoor storage areas.

Signs shall not be obscured or removed.

Signs shall be in English as a primary language or in symbols allowed by this code.

Signs shall be durable. The size, color and lettering shall be in accordance with nationally recognized standards.

8003.1.3 Sources of ignition. Smoking shall be prohibited in rooms where hazardous materials are stored or within 25 feet (7620 mm) of outdoor storage areas.

Open flames and high-temperature devices shall not be used in a manner which creates a hazardous condition. Energy-consuming equipment listed for use with the hazardous material stored is allowed.

8003.1.4 Shelving. Shelving shall be of substantial construction, adequately braced and anchored. For seismic requirements and the seismic zone in which the shelving is located, see the Building Code.

Shelves shall be provided with a lip or guard when used for the storage of individual containers.

EXCEPTION: Shelving in hazardous materials storage cabinets or laboratory furniture specifically designed for such use.

Shelf storage of hazardous materials shall be maintained in an orderly manner.

8003.1.5 Maximum quantity on site. The storage of hazardous materials shall be in accordance with local zoning regulations.

8003.1.6 Storage plan. A storage plan shall be provided for all storage facilities. The plan shall indicate the intended storage arrangement, including the location and dimensions of aisles.

8003.1.7 Spill control, drainage control and secondary containment.

8003.1.7.1 General. Rooms, buildings or areas used for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off spillage and fire-protection water discharged in the storage area in accordance with Section 8003.1.7.

EXCEPTIONS:
1. Liquids that are a gas at NTP.
2. Outdoor storage of containers on approved containment pallets in accordance with Section 8003.1.7.5 do not require spill control, drainage control or secondary containment.
3. Storage of flammable solids.

8003.1.7.2 Spill control. Floors shall be sloped; constructed with sumps and collection systems; recessed a minimum of 4 inches (101.6 mm); provided with a liquid-tight raised sill to a minimum height of 4 inches (101.6 mm) to prevent the flow of liquids to adjoining areas; or otherwise constructed to contain a spill from the largest single container or tank. Except for surfacing, the sill shall be constructed of noncombustible material, and the liquid-tight seal shall be compatible with the material stored. When liquid-tight sills are provided, they are not required at door openings which are provided with an open-grate trench that connects to an approved drainage system.

8003.1.7.3 Drainage control.

8003.1.7.3.1 General. Rooms, buildings or areas shall be provided with a drainage system to direct the flow of liquids to an approved location, or the room, building or area shall be designed to provide secondary containment for the hazardous materials and fire-protection water.

8003.1.7.3.2 Slope. A slope to drain not less than 1 percent shall be provided.

8003.1.7.3.3 Capacity for fire-extinguishing water. Drains from the area shall be sized to carry the automatic fire-extinguishing system design flow rate over the system design area.

8003.1.7.3.4 Materials. Materials of construction for the drainage system shall be compatible with the stored materials.

8003.1.7.3.5 Incompatible materials. Incompatible materials shall be separated from each other in drain systems. Incompatible materials are allowed to be combined when they have been rendered acceptable by an approved means for discharge into the public sewer.

8003.1.7.3.6 Termination. Flow from the drainage system shall be directed to an approved location.

Drainage of spillage and fire-protection water is allowed to be directed to a neutralizer or treatment system which complies with the following:

1. The system shall be designed to handle the maximum worst case spill from the single largest container plus the volume of fire-protection water from the system over the minimum design area for a period of 20 minutes, and

2. The system shall be designed to overflow from the neutralizer or treatment system so that liquid leakage and fire-protection water is directed to a safe location away from the building, valves, means of egress, adjoining property and fire department access roadways.

8003.1.7.4 Secondary containment. Drains shall be directed to containment systems or other locations designed as secondary containment for the hazardous materials liquids and fire-protection water, or the building, room or area shall be designed to provide secondary containment of hazardous material liquids and fire-protection water through the use of recessed floors or liquid-tight raised sills.

EXCEPTIONS:
1. The provisions of Section 8003.1.7.4 may be waived when the chief has determined that such enforcement is preempted by other codes, statutes or ordinances. See Section 8001.1.3.

2. Outdoor storage of oxidizers.
3. Outdoor storage of organic peroxides.
4. Storage of pyrophoric solids.
5. Storage of corrosive solids.
6. Storage of carcinogen, irritant, sensitizer and other health hazard solids.

Secondary containment shall be designed to retain the spill from the largest single container plus the design flow rate of the automatic fire-extinguishing system for the area of the room or area in which the storage is located or the system design area, whichever is smaller. The containment capacity shall be capable of containing the flow for a period of 20 minutes.

Overflow from the secondary containment system shall be provided to direct liquid leakage and fire-protection water to a safe location away from the building, valves, means of egress, fire access roadway, adjoining property or storm drains.

If the storage area is open to rainfall, the secondary containment shall be designed to accommodate the volume of a 24-hour rainfall as determined by a 25-year storm. Where curbs are used, provisions shall be made for draining accumulations of groundwater or rainwater.

A monitoring method capable of detecting hazardous material leakage from the primary containment into the secondary containment shall be provided. Visual inspection of the primary containment shall be used unless other means of monitoring are approved by the chief. Where secondary containment is subject to the intrusion of water, a monitoring method for such water shall be provided. When monitoring devices are provided, they shall be connected to distinct visual or audible alarms.

8003.1.7.5 Containment pallets. When used as a substitute for spill control, drainage control and secondary containment for outdoor storage in accordance with Section 8003.1.7.1, Exception 2, containment pallets shall comply with the following:

1. A liquid-tight sump accessible for visual inspection shall be provided,

2. The sump shall be designed to contain not less than 66 gallons (249.8 L),

3. Exposed surfaces shall be compatible with material stored, and

4. Containment pallets shall be protected to prevent collection of rainwater within the sump.

8003.1.8 Ventilation.

8003.1.8.1 General. Indoor storage areas and storage buildings shall be provided with mechanical exhaust ventilation or natural ventilation where natural ventilation can be shown to be acceptable for the materials as stored.

EXCEPTION: Storage areas for flammable solids. See also Article 76.

8003.1.8.2 System requirements. Exhaust ventilation systems shall comply with all of the following:

1. Installation shall be in accordance with the Mechanical Code,

2. Mechanical ventilation shall be at a rate of not less than 1 cubic foot per minute per square foot (5.1 l/s per m^2) of floor area over the storage area,

3. Systems shall operate continuously unless alternate designs are approved by the chief,

4. A manual shutoff control shall be provided outside of the room in a position adjacent to the access door to the room or in a location approved by the chief. The switch shall be of the break-glass type and shall be labeled VENTILATION SYSTEM EMERGENCY SHUTOFF,

5. Exhaust ventilation shall be arranged to consider the density of the potential fumes or vapors released. For fumes or vapors that are heavier than air, exhaust shall be taken from a point within 12 inches (304.8 mm) of the floor,

6. The location of both the exhaust and inlet air openings shall be arranged to provide air movement across all portions of the floor or room to prevent the accumulation of vapors, and

7. Exhaust ventilation shall not be recirculated within the room or building if the materials stored are capable of emitting hazardous vapors.

8003.1.9 Separation of incompatible hazardous materials. See Section 8001.9.8.

8003.1.10 Hazardous materials storage cabinets.

8003.1.10.1 General. When storage cabinets are used to comply with Article 80, such cabinets shall be in accordance with Section 8003.1.10.

EXCEPTION: Compressed gases shall be stored in cabinets or exhausted enclosures designed in accordance with Section 8003.3.1.3.2 or 8003.3.1.3.3.

Cabinets shall be conspicuously labeled in red letters on contrasting background HAZARDOUS—KEEP FIRE AWAY.

8003.1.10.2 Construction. Cabinets shall be constructed of metal. The interior of cabinets shall be treated, coated or constructed of materials that are nonreactive with the hazardous material stored. Such treatment, coating or construction shall include the entire interior of the cabinet. Cabinets shall either be listed as suitable for the intended storage or constructed in accordance with the following:

1. Cabinets shall be of steel having a thickness of not less than 0.044 inch (1.12 mm) (18 gage). The cabinet, including the door, shall be double walled with 1½-inch (38.1 mm) airspace between the walls. Joints shall be riveted or welded and shall be tightfitting. Doors shall be well fitted, self-closing and equipped with a self-latching device, and

2. The bottoms of cabinets utilized for the storage of liquids shall be liquid tight to a minimum height of 2 inches (50.8 mm).

For requirements regarding electrical equipment and devices within cabinets used for the storage of hazardous gases or liquids, see the Electrical Code.

8003.1.11 Fire-extinguishing systems. Indoor storage areas and storage buildings shall be protected by an automat-

ic sprinkler system. The design of the sprinkler system shall not be less than that required by the Building Code for Ordinary Hazard Group 2 with a minimum design area of 3,000 square feet (278.7 m²). See U.B.C. Standard 9-1. Where the materials or storage arrangement requires a higher level of sprinkler system protection in accordance with nationally recognized standards, the higher level of sprinkler system protection shall be provided.

EXCEPTION: Approved alternate automatic fire-extinguishing systems are allowed.

8003.1.12 Explosion control. Indoor storage rooms, areas and buildings containing the following materials shall be provided with explosion control in accordance with the Building Code:

1. Highly toxic flammable or toxic flammable gases when not stored in gas cabinets, exhausted enclosures or gas rooms (see Section 8003.1.3).

2. Combustible dusts. See Article 76.

3. Class 4 oxidizers.

4. Unclassified detonatable and Class I organic peroxides.

5. Pyrophoric gases.

6. Class 3 and 4 unstable (reactive) materials.

7. Class 2 and 3 water-reactive solids and liquids.

8003.1.13 Standby power. When mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be connected to a secondary source of power to automatically supply electrical power in the event of loss of power from the primary source. See the Electrical Code.

EXCEPTIONS: Storage areas for:
1. Class 1 and 2 oxidizers.
2. Class III, IV and V organic peroxides.

8003.1.14 Limit controls.

8003.1.14.1 General. Limit controls shall be provided in accordance with Section 8003.1.14.

8003.1.14.2 Liquid-level limit control. Atmospheric tanks with a capacity exceeding 500 gallons (1893 L) used for the storage of hazardous materials liquids shall be equipped with a liquid-level limit control to prevent overfilling of the tank.

EXCEPTIONS: 1. Tanks monitored by a system which will limit net contents by weight.
2. Atmospheric tanks used for storage of Class II, III, IV and V organic peroxides.

8003.1.14.3 Temperature control. Materials which must be stored at temperatures other than normal ambient temperatures to prevent a hazardous reaction shall be stored in an area provided with a means to maintain the temperature within a safe range. Redundant temperature control equipment which will operate upon failure of the primary temperature control system shall be provided. Alternate means which prevent a hazardous reaction are allowed.

8003.1.14.4 Pressure control. Stationary tanks used for the storage of hazardous materials liquids which can generate pressures exceeding the tank design limits due to exposure fires or internal reaction shall have some form of construction or device that will relieve excessive internal pressure. Such relief devices shall vent to an approved location or to an exhaust scrubber or treatment system when specified in Sections 8003.2 through 8003.15.

8003.1.15 Emergency alarm. An approved emergency alarm system shall be provided in buildings, rooms or areas used for storage of hazardous materials. Emergency alarm-initiating devices shall be installed outside of each interior exit door of storage buildings, rooms or areas. Activation of an emergency alarm-initiating device shall sound a local alarm to alert occupants of an emergency situation involving hazardous materials.

8003.1.16 Supervision. Emergency alarm, detection and automatic fire-extinguishing systems required by Section 8003 shall be supervised by an approved central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

8003.1.17 Clearance from combustibles. The area surrounding an outdoor storage area or tank shall be kept clear of combustible materials and vegetation for a minimum distance of 30 feet (9144 mm).

8003.1.18 Noncombustible floor. Except for surfacing, floors of storage areas shall be of noncombustible construction.

8003.1.19 Professional engineer. The chief is authorized to require design submittals to bear the stamp of a professional engineer.

8003.1.20 Weather protection. When overhead noncombustible construction is provided for sheltering outdoor hazardous material storage areas, such storage shall not be considered indoor storage when all of the following conditions are met:

EXCEPTIONS: Storage of explosive, detonatable or pyrophoric materials shall be considered as indoor storage.
1. Supports shall be of noncombustible construction,
2. Supports and walls shall not obstruct more that 25 percent of the perimeter of the storage area, and
3. The distance to buildings, property lines, streets, alleys, public ways or exits to a public way shall not be less than the distance required for an outdoor hazardous material storage area without weather protection.

8003.1.21 Required detached storage. Group H Occupancies containing quantities of hazardous materials in excess of those set forth in Table 8003.1-A shall be in buildings used for no other purpose, shall not exceed one story in height and shall be without basements, crawl spaces or other underfloor spaces.

8003.2 Explosives and Blasting Agents. Storage of explosives and blasting agents shall be in accordance with Article 77. Storage of fireworks shall be in accordance with Article 78.

Storage of explosives, blasting agents, blackpowder and fireworks shall be in detached buildings in accordance with Section 8003.1.21 when required by Section 8003.1.21.

8003.3 Toxic and Highly Toxic Compressed Gases.

8003.3.1 Indoor storage.

8003.3.1.1 General. Indoor storage of toxic and highly toxic compressed gases in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1, 8003.3.1 and 8003.3.3.

8003.3.1.2 Fire-extinguishing system. In addition to Section 8003.1.11, the following requirements shall apply:

1. Gas cabinets, exhausted enclosures and gas rooms for the storage of cylinders shall be internally sprinklered, and

2. Alternate fire-extinguishing systems shall not be used for storage areas, gas cabinets, exhausted enclosures or gas rooms.

8003.3.1.3 Ventilation and storage arrangement.

8003.3.1.3.1 Ventilated area. Cylinders shall be stored within gas cabinets, exhausted enclosures or gas rooms.

EXCEPTION: Toxic gas cylinders having an aggregate capacity not exceeding the exempt amounts set forth in Table 8001.13-B when Footnote 6 is not applied.

Portable and stationary tanks shall be stored within gas rooms or exhausted enclosures. The room or area in which gas cabinets or exhausted enclosures are located shall be provided with exhaust ventilation that is independent of the ventilation required for gas cabinets and exhausted enclosures.

8003.3.1.3.2 Gas cabinets. Gas cabinets shall comply with all of the following:

1. Operate at negative pressure in relation to the surrounding area,

2. Be provided with self-closing limited access ports or noncombustible windows to give access to equipment controls. The average velocity at the face of access ports or windows shall not be less than 200 feet per minute (1.02 m/s) with a minimum of 150 feet per minute (0.76 m/s) at any point of the access port or window,

3. Be connected to an exhaust system,

4. Be provided with self-closing doors, and

5. Be constructed of not less than 0.097-inch (2.46 mm) (12 gage) steel.

8003.3.1.3.3 Exhausted enclosures. Exhausted enclosures shall be designed to:

1. Operate at a negative pressure in relation to the surrounding area, and

2. Provide an average velocity at the face of the enclosure of not less than 200 feet per minute (1.02 m/s) with a minimum of 150 feet per minute (0.76 m/s) at any point.

8003.3.1.3.4 Gas rooms. Gas rooms shall be designed to:

1. Operate at a negative pressure in relation to the surrounding area, and

2. Direct the exhaust ventilation to an exhaust system.

8003.3.1.3.5 Treatment systems.

8003.3.1.3.5.1 General. Treatment systems shall be utilized to handle the accidental release of gas. Treatment systems shall be utilized to process all exhaust ventilation to be discharged from gas cabinets, exhausted enclosures and gas rooms.

8003.3.1.3.5.2 Design. Treatment systems shall be capable of diluting, adsorbing, absorbing, containing, neutralizing, burning or otherwise processing the entire contents of the largest single tank or cylinder of gas stored or used. When a total containment system is utilized, the system shall be designed to handle the maximum anticipated pressure of release to the system when it reaches equilibrium.

8003.3.1.3.5.3 Performance. Treatment systems shall be designed to reduce the maximum allowable discharge concentration of the gas to one-half IDLH at the point of discharge to the atmosphere. When more than one gas is emitted to the treatment system, the treatment system shall be designed to handle the worst-case release based on the release rate, the quantity and the IDLH for all the gases stored or used.

8003.3.1.3.5.4 Sizing. Treatment systems shall be sized to process the maximum worst-case release of gas based on the maximum flow rate of release from the largest cylinder or tank utilized. The entire contents of tanks and cylinders shall be considered.

8003.3.1.3.5.5 Stationary tanks. Stationary tanks shall be labeled with the maximum rate of release for the gas contained based on valves or fittings that are inserted directly into the tank. If multiple valves or fittings are provided, the maximum flow rate of release for the valve or fitting with the highest flow rate shall be indicated. If liquefied gases are in contact with valves or fittings, the liquid flow rate shall be utilized for purposes of computation. Flow rates indicated on the label shall be converted to cubic feet per minute (L/s) of gas at normal temperature and pressure.

8003.3.1.3.5.6 Portable tanks and cylinders. For portable tanks and cylinders, the maximum flow rate of release shall be calculated based on assuming the total release from the cylinder or tank within the time specified in Table 8003.3-A. When portable tanks or cylinders are equipped with approved excess flow or reduced flow valves, the worst-case release shall be determined by the maximum achievable flow from the valve as determined by the valve manufacturer or the gas supplier. Reduced flow and excess flow valves shall be permanently marked by the manufacturer to indicate the maximum design flow rate. Such markings shall indicate the flow rate for air under standard conditions.

8003.3.1.4 Emergency power. Emergency power shall be provided in lieu of standby power for:

1. Exhaust ventilation, including the power supply for treatment systems,

2. Gas-detection systems,

3. Emergency alarm systems, and

4. Temperature-control systems.

8003.3.1.5 Limit controls. In addition to the limit controls required by Section 8003.1.14, excess flow control shall be provided for stationary tanks which are piped for filling or dispensing.

8003.3.1.6 Gas detection. A continuous gas-detection system shall be provided to detect the presence of gas at or below the permissible exposure limit or ceiling limit. The detection system shall initiate a local alarm and transmit a signal to a constantly attended control station.

The alarm shall be both visual and audible and shall be designed to provide warning both inside and outside of the storage area. The audible alarm shall be distinct from all other alarms.

EXCEPTIONS: 1. Signal transmission to a constantly attended control station need not be provided when not more than one cylinder is stored.
2. A continuous gas-detection system need not be provided for toxic gases when the physiological warning properties for the gas are at a level below the accepted permissible exposure limit for the gas.

The gas-detection system shall be capable of monitoring the room or area in which the gas is stored at or below the permissible exposure limit or ceiling limit and the discharge from the treatment system at or below one-half the IDLH limit.

8003.3.1.7 Smoke detection. An approved supervised smoke-detection system shall be provided in rooms or areas where highly toxic compressed gases are stored indoors. Activation of the detection systems shall sound a local alarm.

8003.3.1.8 Maximum number of cylinders per gas cabinet. The number of cylinders contained in a single gas cabinet shall not exceed three.

EXCEPTION: Cabinets containing cylinders not exceeding 1 pound (0.4536 kg) net contents each shall be limited to a maximum of 100 cylinders.

8003.3.2 Outdoor storage.

8003.3.2.1 General. Outdoor storage of highly toxic or toxic compressed gases in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1, 8003.3.2 and 8003.3.3.

8003.3.2.2 Distance from storage to exposures.

8003.3.2.2.1 General. Outdoor storage of highly toxic or toxic compressed gases shall comply with the Building Code and Section 8003.3.2.2.

8003.3.2.2.2 Distance limitation to exposures. Outdoor storage of highly toxic or toxic compressed gases shall not be within 75 feet (22 860 mm) of a building, property line, street, alley, public way or exit to a public way unless the storage is shielded by a structure having a minimum fire-resistive rating of two hours and which interrupts the line of sight between the storage and the exposure. The protective structure shall be at least 5 feet (1524 mm) from exposures. The protective structure shall not have more than two sides at approximately 90-degree directions, or three sides with connecting angles of approximately 135 degrees.

EXCEPTION: Gases in gas cabinets complying with Section 8003.3.1.3.2 and located 5 feet (1524 mm) or more from buildings and 25 feet (7620 mm) from exits. Section 8003.3.2.2.3 shall not apply.

8003.3.2.2.3 Openings in exposed buildings. When the storage area is located closer than 75 feet (22 860 mm) to a building, openings into a building other than piping shall not be above the height of the top of the shielding structure or within 50 feet (15 240 mm) horizontally from the storage area whether or not shielded by a protective structure.

8003.3.2.2.4 Air intakes. The storage area shall not be within 75 feet (22 860 mm) of air intakes.

8003.3.2.3 Canopies. Portable tanks and cylinders stored outside of buildings shall be stored under a canopy of noncombustible construction. Such storage shall not be considered indoor storage. See also Section 8003.1.20.

EXCEPTION: Portable tanks and cylinders used for storing anhydrous ammonia (fertilizer grade).

An automatic fire-sprinkler system shall be provided for canopies used for storage of highly toxic or toxic compressed gases.

EXCEPTION: Where water is incompatible with the hazardous material stored, the chief may approve alternate fire suppression methods to an automatic fire-sprinkler system.

8003.3.2.4 Piping and controls. In addition to the requirements of Section 8001.4.3, piping and controls on stationary tanks shall be in accordance with all of the following:

1. Pressure-relief devices shall be vented to a treatment system designed in accordance with Section 8003.3.1.3.5,

2. Where filling or dispensing connections are provided, they shall have a means of local exhaust. Such exhaust shall be designed to capture fumes and vapors. The exhaust shall be directed to a treatment system designed in accordance with Section 8003.3.1.3.5, and

3. Stationary tanks shall be provided with a means of excess flow control on tank inlet and outlet connections.

EXCEPTIONS: 1. Inlet connections that are designed to preclude backflow.
2. Pressure-relief devices.

8003.3.3 Special provisions.

8003.3.3.1 Seismic protection. Stationary tanks and associated piping systems shall be seismically braced in accordance with the Building Code.

8003.3.3.2 Security. See Section 8001.9.2.

8003.3.3.3 Leaking cylinders. One or more gas cabinets or exhausted enclosures shall be provided to handle leaking cylinders.

EXCEPTIONS: A cabinet or exhausted enclosure need not be provided for leaking cylinders if:
1. All cylinders are stored within gas cabinets or exhausted enclosures, or
2. Approved containment vessels are provided in accordance with all of the following:
2.1 Containment vessels shall be capable of fully containing a release,
2.2 Trained personnel shall be available at an approved location, and
2.3 Containment vessels shall be capable of being transported to the leaking cylinder.

Gas cabinets or exhausted enclosures shall be located as follows:

1. Within or adjacent to outdoor storage areas, or

2. Within gas rooms.

Gas cabinets or exhausted enclosures shall be connected to an exhaust system. See Section 8003.3.1.3.5.

8003.3.3.4 Local exhaust for leaking portable tanks. A means of local exhaust shall be provided to capture leaks from portable tanks. Portable ducts or collection systems designed to be applied to the site of a leak in a valve or fitting on the tank are acceptable. The local exhaust system shall be connected to a treatment system as specified in Section 8003.3.1.3.5. The local exhaust system shall be provided:

1. Within or immediately adjacent to outdoor storage areas, or

2. Within gas rooms used for portable or stationary tanks.

8003.4 Flammable and Combustible Liquids. Storage of flammable and combustible liquids shall be in accordance with Article 79.

8003.5 Flammable Solids and Flammable Gases.

8003.5.1 Indoor storage.

8003.5.1.1 General. Indoor storage of flammable solids and flammable gases in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.5.1. Storage of combustible fibers shall be in accordance with Article 28. See also Section 8001.14.2 for storage of flammable gases in quantities not exceeding exempt amounts.

8003.5.1.2 Pile size limits and location for solids. Flammable solids stored in quantities greater than 1,000 cubic feet (28.3 m^3) shall be separated into piles each not larger than 1,000 cubic feet (28.3 m^3). Aisle widths between piles shall not be less than the height of the piles or 4 feet (1219 mm), whichever is greater.

Flammable solids shall not be stored in basements.

8003.5.1.3 Static-producing equipment. Static-producing equipment located in flammable gas storage areas shall be grounded.

8003.5.2 Outdoor storage.

8003.5.2.1 General. Outdoor storage of flammable solids and flammable gases in amounts exceeding exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.5.2. Storage of combustible fibers shall be in accordance with Article 28.

8003.5.2.2 Distance from storage to exposures. Outdoor storage of flammable solids shall not be located within 20 feet (6096 mm) of any building, property line, street, alley, public way, or exit to a public way. An unpierced two-hour fire-resistive wall extending not less than 30 inches (762 mm) above and to the sides of the storage area is allowed in lieu of such distance.

Outdoor storage of flammable gases shall be in accordance with Table 8003.5-A.

8003.5.2.3 Pile size limits for solids. Outdoor storage of flammable solids shall be separated into piles not larger than 5,000 cubic feet (141 m^3) each. Aisle widths between piles shall not be less than one-half the height of the piles or 10 feet (3048 mm), whichever is greater.

8003.5.2.4 Static-producing equipment. Static-producing equipment in flammable gas storage areas shall be grounded.

8003.6 Oxidizers.

8003.6.1 Indoor storage.

8003.6.1.1 General. Indoor storage of oxidizers in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.6.1. Retail display of oxidizers shall be in accordance with Section 8001.12.

See also Section 8001.14.3 for storage of oxidizing gases in quantities not exceeding exempt amounts.

8003.6.1.2 Detached storage. Storage of liquid and solid oxidizers shall be in detached buildings in accordance with Section 8003.1.21 when required by Section 8003.1.21.

8003.6.1.3 Distance from detached storage buildings to exposures. In addition to the requirements of the Building Code, detached storage buildings shall be located in accordance with Tables 8003.6-A and 8003.6-B.

8003.6.1.4 Liquid-tight floor. In addition to Section 8003.1.18, floors of storage areas for liquid and solid oxidizers shall be of liquid-tight construction.

8003.6.1.5 Smoke and heat venting. Smoke and heat venting shall be provided. The design criteria shall be as set forth in the Building Code.

8003.6.1.6 Smoke detection. An approved supervised smoke-detection system shall be installed in liquid and solid oxidizer storage areas. Activation of the detection systems shall sound a local alarm.

EXCEPTION: A smoke-detection system need not be provided in detached storage buildings protected by an automatic fire-extinguishing system.

8003.6.1.7 Storage conditions. The maximum quantities per building in detached storage buildings shall not exceed those set forth in Tables 8003.6-C through 8003.6-F.

The storage arrangement for liquid and solid oxidizers shall be as set forth in Tables 8003.6-C through 8003.6-F.

Class 2 oxidizers shall not be stored in basements except when such storage is in stationary tanks. Class 3 and 4 oxidizers in excess of the exempt amounts set forth in Section 8001.13 shall be stored on the ground floor only.

8003.6.1.8 Separation of Class 4 oxidizers from other materials. In addition to Section 8001.9.8, Class 4 oxidizer liquids and solids shall be separated from other hazardous materials by not less than one-hour fire-resistive construction or stored in hazardous materials storage cabinets. See Section 8003.1.10.

Detached storage buildings for Class 4 oxidizer liquids and solids shall be located a minimum of 50 feet (15 240 mm) from other hazardous materials storage.

8003.6.1.9 Contamination. Liquid and solid oxidizers shall not be stored on or against combustible surfaces. During storage, care shall be taken to prevent contamination.

8003.6.1.10 Static-producing equipment. Static-producing equipment in oxidizer gas storage areas shall be grounded.

8003.6.2 Outdoor storage.

8003.6.2.1 General. Outdoor storage of oxidizers in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Section 8003.1 and 8003.6.2.

8003.6.2.2 Distance from storage to exposures.

8003.6.2.2.1 Solids and liquids. Storage areas for liquid and solid oxidizers shall be located in accordance with Tables 8003.6-A and 8003.6-B.

8003.6.2.2.2 Gases. Storage areas for oxidizer gases shall be in accordance with Table 8003.6-G.

8003.6.2.3 Storage conditions.

8003.6.2.3.1 Solids and liquids. Storage arrangements for liquid and solid oxidizers shall be in accordance with Tables 8003.6-C through 8003.6-F.

8003.6.2.3.2 Gases. Storage arrangement for oxidizer gases shall be in accordance with Table 8003.6-G.

8003.7 Organic Peroxides.

8003.7.1 Indoor storage.

8003.7.1.1 General. Indoor storage of organic peroxides in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.7.1.

Unclassified detonatable organic peroxides that are capable of detonation in their normal shipping containers under conditions of fire exposure shall be stored in accordance with Article 77 as required for high explosives.

8003.7.1.2 Detached storage. Storage of organic peroxides shall be in detached buildings in accordance with Section 8003.1.21 when required by Section 8003.1.21.

8003.7.1.3 Distance from detached storage buildings to exposures. In addition to the requirements of the Building Code, detached storage buildings shall be located in accordance with Tables 8003.7-A and 8003.7-B.

8003.7.1.4 Liquid-tight floor. In addition to Section 8003.1.18, floors of storage areas shall be of liquid-tight construction.

8003.7.1.5 Smoke and heat venting. Smoke and heat venting shall be provided. The design criteria shall be as set forth in the Building Code.

8003.7.1.6 Electrical wiring and equipment. In addition to Section 8001.9.4, electrical wiring and equipment in storage areas for Class I or II organic peroxides shall comply with the requirements for electrical Class I, Division 2 locations.

8003.7.1.7 Smoke detection. An approved supervised smoke-detection system shall be provided in rooms or areas where Class I, II, III or IV organic peroxides are stored. Activation of the detection system shall sound a local alarm.

EXCEPTION: A smoke-detection system need not be provided in detached storage buildings protected by an automatic fire-extinguishing system.

8003.7.1.8 Storage conditions.

8003.7.1.8.1 Maximum quantities. Maximum quantity per building in a mixed-occupancy building shall not exceed the amounts set forth in Table 8003.1-A. Maximum quantity per building in a detached storage building shall not exceed the amounts specified in Tables 8003.7-A and 8003.7-B.

8003.7.1.8.2 Storage arrangement. Storage arrangement for organic peroxides shall be in accordance with Tables 8003.7-C through 8003.7-E and shall comply with all of the following:

1. Containers and packages in storage areas shall be closed,

2. Bulk storage shall not be in piles or bins,

3. A minimum 2-foot (609.6 mm) clear space shall be maintained between storage and uninsulated metal walls, and

4. Fifty-five-gallon (208.2 L) drums shall not be stored more than one drum high.

8003.7.1.8.3 Location in building. The storage of Class I and II organic peroxides shall be on the ground floor. Class III organic peroxides shall not be stored in basements.

8003.7.1.9 Contamination. Organic peroxides shall be stored in their original DOT shipping containers. During storage, care shall be taken to prevent contamination.

8003.7.2 Outdoor storage.

8003.7.2.1 General. Outdoor storage of organic peroxides in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.7.2.

EXCEPTION: Unclassified detonatable organic peroxides that are capable of detonation in their normal shipping containers under fire conditions shall be stored in accordance with Article 77 as required for high explosives.

8003.7.2.2 Distance from storage to exposures. Storage areas for organic peroxides shall be located in accordance with Tables 8003.7-A and 8003.7-B.

8003.7.2.3 Electrical wiring and equipment. In addition to Section 8001.9.4, electrical wiring and equipment in outdoor storage areas containing Class I, II or III organic peroxides shall comply with the requirements for electrical Class I, Division 2 locations.

8003.7.2.4 Storage conditions.

8003.7.2.4.1 Maximum quantities. Maximum quantities of organic peroxides shall be in accordance with Tables 8003.7-A and 8003.7-B.

8003.7.2.4.2 Storage arrangement. Storage arrangement shall be in accordance with Tables 8003.7-C, 8003.7-D and 8003.7-E.

8003.7.2.5 Separation. In addition to Section 8001.9.8, storage areas for organic peroxides exceeding the amounts specified in Table 8003.1-A shall be located a minimum distance of 50 feet (15 240 mm) from other hazardous material storage.

8003.8 Pyrophoric Materials.

8003.8.1 Indoor storage.

8003.8.1.1 General. Indoor storage of pyrophoric solids, liquids and gases in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.8.1. See also Section 8001.14.4.

Indoor storage of silane and mixtures of silane greater than 2 percent by volume shall be in accordance with U.F.C. Standard 80-1.

8003.8.1.2 Liquid-tight floor. In addition to Section 8003.1.18, floors of storage areas containing pyrophoric liquids shall be of liquid-tight construction.

8003.8.1.3 Electrical wiring and equipment. In addition to Section 8001.9.4, electrical wiring and equipment in storage areas for pyrophoric gases shall comply with the requirements for electrical Class I, Division 2 locations.

8003.8.1.4 Storage conditions.

8003.8.1.4.1 Pyrophoric solids and liquids. Storage of pyrophoric liquids and solids shall be limited to a maximum area of 100 square feet (9.29 m^2) per pile. Storage shall not exceed 5 feet (1524 mm) in height. Individual containers shall not be stacked.

Aisles between storage piles shall be a minimum of 10 feet (3048 mm) in width.

Individual tanks or containers shall not exceed 500 gallons (1893 L) capacity.

8003.8.1.4.2 Pyrophoric gases. Storage of pyrophoric gases shall be in detached buildings in accordance with Section 8003.1.21 when required by Section 8003.1.21.

8003.8.1.5 Separation. In addition to Section 8001.9.8, indoor storage of pyrophoric solids, liquids and gases shall be isolated from incompatible hazardous materials by one-hour fire-resistive walls with openings protected in accordance with the Building Code.

EXCEPTION: Storage in approved hazardous materials storage cabinets constructed in accordance with Section 8003.1.10.

8003.8.2 Outdoor storage.

8003.8.2.1 General. Outdoor storage of pyrophoric solids, liquids and gases in quantities exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.8.2.

Outdoor storage of silane and mixtures of silane greater than 2 percent by volume shall be in accordance with U.F.C. Standard 80-1.

8003.8.2.2 Distance from storage to exposures. The separation of pyrophoric solids, liquids and gases from buildings, property lines, streets, alleys, public ways or exits to a public way shall be in accordance with the following:

1. **Solids and liquids.** Twice the separation required by Article 79 for Class I-B flammable liquids.

2. **Gases.** The location and maximum amount of pyrophoric gas per storage area shall be in accordance with Table 8003.8-A.

8003.8.2.3 Storage conditions. Quantities, arrangement and spacing for pyrophoric liquids and solids in tanks, portable tanks and containers shall be in accordance with Article 79 as required for Class I-B flammable liquids.

8003.8.2.4 Separation of incompatible materials. In addition to Section 8001.9.8, separation of pyrophoric liquids and solids from other hazardous materials shall be in accordance with Article 79 as required for Class I-B flammable liquids.

8003.9 Unstable (Reactive) Materials.

8003.9.1 Indoor storage.

8003.9.1.1 General. Indoor storage of unstable (reactive) materials in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.9.1.

In addition, Class 3 and 4 unstable (reactive) detonatable materials shall be stored in accordance with the Building Code requirements for explosives.

Retail display of unstable (reactive) materials shall be in accordance with Section 8001.12.

8003.9.1.2 Detached storage. Storage of unstable (reactive) materials shall be in detached buildings in accordance with Section 8003.1.21 when required by Section 8003.1.21.

8003.9.1.3 Liquid-tight floor. In addition to Section 8003.1.18, floors of storage areas for liquids and solids shall be of liquid-tight construction.

8003.9.1.4 Smoke and heat venting. Smoke and heat venting shall be provided. The design criteria shall be as set forth in the Building Code.

8003.9.1.5 Storage conditions. Unstable (reactive) materials stored in quantities greater than 500 cubic feet (14.16 m^3) shall be separated into piles, each not larger than 500 cubic feet (14.16 m^3). Aisle width shall not be less than the height of the piles or 4 feet (1219 mm), whichever is greater.

EXCEPTION: Materials stored in tanks.

Unstable (reactive) materials shall not be stored in basements.

8003.9.2 Outdoor storage.

8003.9.2.1 General. Outdoor storage of unstable (reactive) materials in quantities exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.9.2.

8003.9.2.2 Distance from storage to exposures. Outdoor storage of unstable (reactive) material which can deflagrate shall not be within 75 feet (22 860 mm) of buildings, property lines, streets, alleys, public ways or exits to a public way.

Outdoor storage of nondeflagrating unstable (reactive) materials shall not be within 20 feet (6096 mm) of buildings, property lines, streets, alleys, public ways or exits to a public way. An unpierced two-hour fire-resistive wall extending not less than 30 inches (762 mm) above and to the sides of the storage is allowed in lieu of such distance.

8003.9.2.3 Storage conditions. Piles of unstable (reactive) materials shall not exceed 1,000 cubic feet (28.3 m^3).

Aisle widths between piles shall not be less than one-half the height of the pile or 10 feet (3048 mm), whichever is greater.

8003.10 Water-reactive Solids and Liquids.

8003.10.1 Indoor storage.

8003.10.1.1 General. Indoor storage of water-reactive solids and liquids in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.10.1.

Retail display of water-reactive solids and liquids shall be in accordance with Section 8001.12.

8003.10.1.2 Detached storage. Storage of water-reactive materials shall be in detached buildings in accordance with Section 8003.1.21 when required by Section 8003.1.21.

8003.10.1.3 Liquid-tight floor. In addition to Section 8003.1.18, floors of storage areas shall be of liquid-tight construction.

8003.10.1.4 Waterproof room. Rooms or areas used for the storage of water-reactive solids or liquids shall be constructed in a manner which resists the penetration of water through the use of waterproof materials. Piping carrying water for other than approved automatic fire-sprinkler systems shall not be within such rooms or areas.

8003.10.1.5 Smoke and heat venting. Smoke and heat venting shall be provided. The design criteria shall be as set forth in the Building Code.

8003.10.1.6 Fire-extinguishing systems. When Class 3 solids or liquids are stored in areas protected by an automatic fire-sprinkler system, the materials shall be stored in closed watertight containers.

8003.10.1.7 Storage conditions. Water-reactive solids and liquids stored in quantities greater than 500 cubic feet (14.16 m^3) shall be separated into piles, each not larger than 500 cubic feet (14.16 m^3). Aisle widths between piles shall not be less than the height of the pile or 4 feet (1219 mm), whichever is greater.

EXCEPTION: Water-reactive solids and liquids stored in tanks.

Class 2 water-reactive solids and liquids shall not be stored in basements unless such materials are stored in closed watertight containers or tanks.

Class 3 water-reactive solids and liquids shall not be stored in basements.

For storage with flammable liquids, see Section 7902.5.4.

8003.10.2 Outdoor storage.

8003.10.2.1 General. Outdoor storage of water-reactive solids and liquids shall be within tanks or closed watertight containers, and in quantities exceeding the exempt amounts set forth in Section 8001.13, shall be in accordance with Sections 8003.1 and 8003.10.2.

8003.10.2.2 Distance from storage to exposures. Outdoor storage of Class 3 water-reactive solids and liquids shall not be within 75 feet (22 860 mm) of buildings, property lines, streets, alleys, public ways or exits to a public way.

Outdoor storage of Class 1 and 2 water-reactive solids and liquids shall not be within 20 feet (6096 mm) of buildings, property lines, streets, alleys, public ways or exits to a public way. An unpierced two-hour fire-resistive wall extending not less than 30 inches (762 mm) above and to the sides of the storage area is allowed in lieu of such distance.

8003.10.2.3 Storage conditions. Class 3 water-reactive solids and liquids shall be limited to piles not greater than 100 cubic feet (2.83 m^3).

Class 1 or 2 water-reactive solids and liquids shall be limited to piles not greater than 1,000 cubic feet (28.3 m^3).

Aisle widths between piles shall not be less than one-half the height of the pile or 10 feet (3048 mm), whichever is greater.

8003.11 Cryogenic Fluids. Storage of cryogenic fluids shall be in accordance with Article 75.

Cryogenic fluids in individual cylinders, containers or tanks which exceed a water capacity of 1,000 pounds (453.6 kg) shall not be stored inside of buildings.

8003.12 Highly Toxic and Toxic Solids and Liquids.

8003.12.1 Indoor storage.

8003.12.1.1 General. Indoor storage of highly toxic and toxic solids and liquids in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.12.1.

Retail display of highly toxic or toxic materials shall be in accordance with Section 8001.12.

8003.12.1.2 Liquid-tight floors. In addition to Section 8003.1.18, floors of storage rooms shall be of liquid-tight construction.

8003.12.1.3 Exhaust scrubber. Exhaust scrubbers or other systems for the processing of highly toxic liquid vapors shall be provided for storage areas where a spill or other accidental release of such liquids can be expected to release highly toxic vapors. Exhaust scrubbers and other processing systems shall be installed in accordance with the Mechanical Code. Emission control shall conform to the requirements of the local air quality authority.

8003.12.1.4 Separation. In addition to Section 8001.9.8, storage of highly toxic liquids and solids shall be isolated from other hazardous materials by one-hour fire-resistive construction or stored in approved hazardous material storage cabinets. See Section 8003.1.10.

8003.12.2 Outdoor storage.

8003.12.2.1 General. Outdoor storage of highly toxic and toxic solids and liquids in quantities exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.12.2.

8003.12.2.2 Distance from storage to exposures. Outdoor storage of highly toxic or toxic solids and liquids shall not be within 20 feet (6096 mm) of buildings, property lines, streets, alleys, public ways or exits to a public way. An

unpierced two-hour fire-resistive wall extending not less than 30 inches (762 mm) above and to the sides of the storage area is allowed in lieu of such distance.

8003.12.2.3 Fire-extinguishing systems. Outdoor storage of highly toxic solids and liquids shall be in fire-resistive containers or shall comply with one of the following:

1. The storage area shall be protected by an automatic, open head, deluge fire-sprinkler system of the type and density specified in the Building Code (see U.B.C. Standard 9-1), or

2. Storage shall be located under a canopy of noncombustible construction, with the canopied area protected by an automatic fire-sprinkler system of the type and density specified in the Building Code. See U.B.C. Standard 9-1. Such storage shall not be considered indoor storage. See Section 8003.1.20.

8003.12.2.4 Storage conditions. Outdoor storage piles of highly toxic solids and liquids shall be separated into piles, each not larger than 2,500 cubic feet (70.79 m^3). Aisle widths between piles shall not be less than one-half the height of the pile or 10 feet (3048 mm), whichever is greater.

The storage of highly toxic liquids which liberate highly toxic vapors in the event of a spill or other accidental discharge shall not be outside of a building unless effective collection and treatment systems are provided. The treatment system shall comply with the Mechanical Code.

8003.13 Radioactive Materials.

8003.13.1 Indoor storage.

8003.13.1.1 General. Indoor storage of radioactive materials in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.13.1.

8003.13.1.2 Liquid-tight floor. In addition to Section 8003.1.18, floors of storage areas shall be of liquid-tight construction.

8003.13.1.3 Detection. Areas used for the storage of radioactive materials shall be provided with detection equipment suitable for determining surface level contamination at levels that would present a short-term hazard condition. Such detection equipment is allowed to be maintained at a location other than the storage area but shall be on the premises.

8003.13.1.4 Storage conditions. The maximum quantity and storage arrangement of radioactive materials to be stored in buildings or rooms designed for such purposes shall be in accordance with the requirements of the Nuclear Regulatory Commission and state and local requirements.

Storage of contaminated combustible materials shall be in tightly closed noncombustible containers which do not contain other waste. Special attention shall be given to prompt disposal of combustible wastes contaminated with oxidizing materials that are subject to spontaneous heating.

8003.13.1.5 Container quantity limits. The quantity of material in any individual container shall not exceed 2 millicuries (7.4 x 10^7 becquerels) for alpha emitters, 200 curies (7.4 x 10^{12} becquerels) for beta emitters or 0.1 curies (3.7 x 10^9 becquerels) for gamma emitters.

EXCEPTION: Licensed, sealed sources for instruments, calibration devices and equipment. Licensing requirements and determination of whether a source is sealed or nonsealed shall be as set forth in Nuclear Regulatory Commission regulations.

8003.13.2 Outdoor storage.

8003.13.2.1 General. Outdoor storage of radioactive materials in quantities exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.13.2.

8003.13.2.2 Distance from storage to exposures. Outdoor storage shall not be within 20 feet (6096 mm) of property lines, streets, alleys, public ways or exits to a public way. An unpierced two-hour fire-resistive wall extending not less than 30 inches (762 mm) above and to the sides of the storage area is allowed in lieu of such distance.

Outdoor storage shall not be within 20 feet (6096 mm) of buildings unless the building exterior walls are not less than one-hour fire-resistive construction. Storage shall not be within 10 feet (3048 mm) from building openings. Building openings less than 20 feet (6096 mm) from outdoor storage shall be protected by a fire assembly having a 45-minute fire-resistive rating.

8003.13.2.3 Fire-extinguishing systems. Outdoor storage of radioactive materials shall be in fire-resistive containers or shall comply with one of the following:

1. The storage area shall be protected by an automatic, open head, deluge fire-sprinkler system of the type and density specified in the Building Code (see U.B.C. Standard 9-1), or

2. Storage shall be located under a canopy of noncombustible construction, with the canopied area protected by an approved automatic fire-extinguishing system. Such storage shall not be considered to be indoor storage. See Section 8003.1.20.

8003.13.2.4 Storage conditions. Storage shall be arranged in accordance with Nuclear Regulatory Commission, state and local requirements.

8003.14 Corrosives.

8003.14.1 Indoor storage.

8003.14.1.1 General. Indoor storage of corrosive materials in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.14.1.

Retail display of corrosive materials shall be in accordance with Section 8001.12.

8003.14.1.2 Liquid-tight floor. In addition to Section 8003.1.18, floors in storage areas for corrosive liquids shall be of liquid-tight construction.

8003.14.2 Outdoor storage.

8003.14.2.1 General. Outdoor storage of corrosive materials in quantities exceeding the exempt amounts set forth in

Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.14.2.

8003.14.2.2 Distance from storage to exposures. Outdoor storage of corrosive liquids shall not be within 20 feet (6096 mm) of buildings, property lines, streets, alleys, public ways or exits to a public way. An unpierced two-hour fire-resistive wall extending not less than 30 inches (762 mm) above and to the side of the storage area is allowed in lieu of such distance.

8003.15 Carcinogens, Irritants, Sensitizers and Other Health Hazard Solids, Liquids and Gases.

8003.15.1 Indoor storage.

8003.15.1.1 General. Indoor storage of carcinogens, irritants, sensitizers and other health hazard solids, liquids and gases in amounts exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.15.1.

Retail display of carcinogens, irritants, sensitizers and other health hazard materials shall be in accordance with Section 8001.12.

8003.15.1.2 Liquid-tight floor. In addition to Section 8003.1.18, floors in storage areas for carcinogens, irritants, sensitizers or other health hazard liquids shall be of liquid-tight construction.

8003.15.2 Outdoor storage.

8003.15.2.1 General. Outdoor storage of carcinogens, irritants, sensitizers and other health hazard solids, liquids and gases in quantities exceeding the exempt amounts set forth in Section 8001.13 shall be in accordance with Sections 8003.1 and 8003.15.2.

8003.15.2.2 Distance from storage to exposures. Outdoor storage of carcinogens, irritants, sensitizers or other health hazard solids, liquids and gases shall not be within 20 feet (6096 mm) of buildings, property lines, streets, alleys, public ways or exits to a public way. An unpierced two-hour fire-resistive wall extending not less than 30 inches (762 mm) above and to the sides of the storage area is allowed in lieu of such distance.

8003.15.2.3 Storage conditions. Outdoor storage of carcinogens, irritants, sensitizers and other health hazard solids and liquids shall be separated into piles not larger than 2,500 cubic feet (70.79 m^3). Aisle widths between piles shall not be less than one-half the height of the piles or 10 feet (3048 mm), whichever is greater.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-8003, filed 12/21/94, effective 6/30/95.]

WAC 51-34-9100 Appendix II-F—Protected aboveground tanks for motor vehicle fuel-dispensing stations outside buildings.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9100, filed 12/21/94, effective 6/30/95.]

WAC 51-34-9101 Section 1—Scope. Storage and dispensing of motor fuels into the fuel tanks of motor vehicles from protected aboveground tanks located outside buildings shall be in accordance with Appendix II-F.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9101, filed 12/21/94, effective 6/30/95.]

WAC 51-34-9102 Section 2—Definitions. For the purpose of Appendix II-F, certain terms are defined as follows:

FUEL-DELIVERY SYSTEM is a system which consists of a tank vehicle containing a pump, fill hose with appropriate connections, and a person who performs the tank filling operation of transferring fuel from the tank vehicle to an aboveground tank. The two types of fuel-delivery systems for aboveground tanks are as follows:

2.1 **PRECONNECTED FLEXIBLE HOSE SYSTEM** is a fuel-delivery system containing a reel-mounted preconnected flexible hose having a maximum nominal diameter of 2 inches (50.8 mm) and a manually controlled fuel-delivery nozzle at the downstream end of the hose.

2.2 **RIGID HOSE SYSTEM** is a fuel-delivery system utilizing one or more sections of large diameter rigid hose [usually 3 to 4 inches (76.2 to 101.6 mm) in nominal diameter] which does not contain a nozzle but which contains interlocking connections for manually connecting the hose from the tank vehicle to the tank.

PRIMARY TANK is a listed aboveground atmospheric tank used to store liquid. See definition of PRIMARY CONTAINMENT in Section 217.

PROTECTED ABOVEGROUND TANK is a listed tank system consisting of a primary tank provided with protection from physical damage, and fire-resistive protection from a high-intensity liquid pool fire exposure. The tank system is allowed to provide these protection elements as a unit or is allowed to be an assembly of components, or a combination thereof.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9102, filed 12/21/94, effective 6/30/95.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 51-34-9103 Section 3—Permits and plans. A permit is required to install, operate, repair or modify protected aboveground tanks used for storage and dispensing of flammable or combustible liquid motor fuels.

The installation plans shall be submitted with permit applications. The plans shall include the design, details, and specifications of the following:

3.1 Quantities and types of liquids to be stored;

3.2 Distances from tanks and dispensers to property lines and buildings;

3.3 Vehicle access;

3.4 Fire appliances;

3.5 Vehicle impact protection;

3.6 Protected aboveground tanks and their supports;

3.7 Method of storage and dispensing;

3.8 Overfill prevention, spill containment, vents, vapor recovery, dispensers, and other equipment and accessories;

3.9 Seismic design in accordance with the Building Code;

3.10 Secondary containment;

3.11 Venting;

3.12 Piping;

3.13 Electrical systems;

3.14 Emergency controls; and

3.15 Other information as required by the chief.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9103, filed 12/21/94, effective 6/30/95.]

WAC 51-34-9104 Section 4—Tank design.

4.1 **General.** Protected aboveground tanks shall be listed and shall meet the requirements of U.F.C. Standard A-II-F-1.

4.2 **Primary Tanks.** Primary tanks shall be designed in accordance with Section 7902.1.8.2.1.

4.3 **Size.** Primary tanks shall not exceed a 10,000-gallon (37 854 L) individual or 40,000-gallon (151 416 L) aggregate capacity.

4.4 **Vents.**

4.4.1 **Capacity.** The vent capacity reduction factor as provided for in Section 7902.2.6.3.4 shall not be allowed.

4.4.2 **Flame arresters.** Approved flame arresters shall be installed in normal vents.

4.5 **Projectile Protection.** When a projectile test is required by the chief, the protected tank shall be tested in accordance with the requirements for bullet resistance as specified in Section 7702.3.4.3.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9104, filed 12/21/94, effective 6/30/95.]

WAC 51-34-9105 Section 5—Installation of tanks. The installation of protected aboveground tanks shall be in accordance with the following:

5.1 **Separation Distances.** A protected aboveground tank shall be separated from property lines, important buildings, public ways and other tanks in accordance with Table A-II-F-1.

TABLE A-II-F-1—MINIMUM SEPARATION REQUIREMENTS FOR PROTECTED ABOVEGROUND TANKS

INDIVIDUAL TANK CAPACITY gallons (liters)	MINIMUM DISTANCE FROM PROPERTY LINE WHICH IS OR CAN BE BUILT UPON, INCLUDING THE OPPOSITE SIDE OF A PUBLIC WAY feet (mm)	MINIMUM DISTANCE FROM THE NEAREST SIDE OF ANY PUBLIC WAY OR FROM THE NEAREST IMPORTANT BUILDING ON THE SAME PROPERTY feet (mm)	MINIMUM DISTANCE BETWEEN TANKS feet (mm)
Less than or equal to 6,000 (22 712)	15 (4572)	5 (1524)	3 (914)
Greater than 6,000 (22 712)	50 (15 240)	25 (7620)	3 (914)

5.2 **Total Quantity.** Protected aboveground tank installations shall not exceed 40,000 gallons (151 416 L) aggregate capacity of primary tanks. Tank installations having the maximum allowable aggregate capacity shall be separated from other installations of protected aboveground tanks by not less than 100 feet (30 480 mm).

5.3 **Secondary Containment.** Protected aboveground tanks shall be provided with drainage control or diking in accordance with Sections 7901.8 and 7902.2.8 or with secondary containment that is a component of the listed protected tank system. Secondary containment systems shall be monitored either visually or automatically. Enclosed secondary containment systems shall be provided with emergency venting.

5.4 **Vehicle Impact Protection.** Guard posts or other approved barrier protection shall be separately provided for each protected aboveground tank and for connected piping subject to vehicle impact. The design of guard posts shall be in accordance with Section 8001.9.3. Also see U.F.C. Standard A-II-F-1, Section 2.7.2.

5.5 **Overfill Prevention.** Protected aboveground tanks shall not be filled in excess of 90 percent of their capacity. An overfill prevention system shall be provided for each tank. During tank filling operation, the system shall:

1. Provide an independent means of notifying the person filling the tank that the fluid level has reached 85 percent of tank capacity by providing an audible or visual alarm signal, providing a tank level gage marked at 85 percent of tank capacity, or other approved means, and

2. Automatically shut off the flow of fuel to the tank when the quantity of liquid in the tank reaches 90 percent of tank capacity. For rigid hose fuel-delivery systems, an approved means shall be provided to empty the fill hose into the tank after the automatic shutoff device is activated.

A permanent sign shall be provided at the fill point for the tank documenting the filling procedure and the tank calibration chart. The filling procedure shall require the person filling the tank to determine the gallonage required to fill it to 90 percent of capacity before commencing the fill operation.

5.6 **Fill Pipe Connections.** The fill pipe shall be provided with a means for making a direct connection to the tank vehicle's fuel-delivery hose so that the delivery of fuel is not exposed to the open air during the filling operation. When any portion of the fill pipe exterior to the tank extends below the level of the top of the tank, a check valve shall be installed in the fill pipe not more than 12 inches (304.8 mm) from the fill hose connection. See Section 7901.11.4 for tank valves.

5.7 **Spill Containers.** A spill container having a capacity of not less than 5 gallons (18.9 L) shall be provided for each fill connection. For tanks with a top fill connection, spill containers shall be noncombustible and shall be fixed to the tank and equipped with a manual drain valve which drains into the primary tank. For tanks with a remote fill connection, a portable spill container shall be provided.

5.8 **Signs.** Warning signs and identification signs shall be installed to clearly identify hazards. The design of such signs shall be in accordance with Sections 5201.8 and 7901.9. Conspicuous signs prohibiting simultaneous tank filling and fuel dispensing shall be posted.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9105, filed 12/21/94, effective 6/30/95.]

WAC 51-34-9106 Section 6—Installation of dispensing and piping systems.

6.1 **General.** Dispensing and piping systems and electrical controls shall be installed in accordance with Section 7901.11 and Article 52, except as provided in Appendix Sections 6.2, 6.3 and 6.4.

6.2 **Tank Openings.** Tank openings in protected aboveground tanks shall be through the top only.

6.3 **Dispensing Devices.** Dispensing devices are allowed to be installed on top of or immediately adjacent to protected aboveground tanks.

6.4 **Antisiphon Devices.** Approved antisiphon devices shall be installed in each external pipe connected to the tank when the pipe extends below the level of the top of the tank.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9106, filed 12/21/94, effective 6/30/95.]

WAC 51-34-9107 Section 7—Parking of tank vehicles. Tank vehicles shall not be parked within 25 feet (7620 mm) of a protected aboveground tank.

EXCEPTION: When the tank is being filled from the tank vehicle.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9107, filed 12/21/94, effective 6/30/95.]

WAC 51-34-9108 Section 8—Maintenance. Protected aboveground tanks, piping and dispensing systems shall be maintained in a safe operating condition. Protected aboveground tanks and components of dispensing systems shall be maintained in accordance with their listings.

Damage to protected aboveground tanks shall be repaired using materials having equal or greater strength and fire resistance.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-34-9108, filed 12/21/94, effective 6/30/95.]

Chapter 51-35 WAC

STATE BUILDING CODE ADOPTION AND AMENDMENT OF THE 1994 EDITION OF THE UNIFORM FIRE CODE STANDARDS (Formerly chapter 51-25 WAC)

WAC

DELETE CHAPTERS 5 AND 6 AND SUBSTITUTE NEW CHAPTERS 5 AND 6 AS FOLLOWS:

WAC 51-35-001 Authority. These rules are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-001, filed 12/21/94, effective 6/30/95.]

WAC 51-35-002 Purpose. The purpose of these rules is to implement the provisions of chapter 19.27 RCW, which provides that the state building code council shall maintain the State Building Code in a status which is consistent with the purpose as set forth in RCW 19.27.020. In maintaining the codes the council shall regularly review updated versions of the codes adopted under the act, and other pertinent information, and shall amend the codes as deemed appropriate by the council.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-002, filed 12/21/94, effective 6/30/95.]

WAC 51-35-003 Uniform Fire Code Standards. The 1994 edition of the Uniform Fire Code Standards as published by the International Fire Code Institute is hereby adopted by reference with the following additions, deletions, and exceptions.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-003, filed 12/21/94, effective 6/30/95.]

WAC 51-35-007 Exceptions. The exceptions and amendments to the Uniform Fire Codes Standards contained in the provisions of chapter 19.27 RCW shall apply in case of conflict with any of the provisions of these rules.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-007, filed 12/21/94, effective 6/30/95.]

WAC 51-35-008 Implementation. The Uniform Fire Code Standards adopted by chapter 51-35 WAC shall become effective in all counties and cities of this state on June 30, 1995.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-008, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52000 Uniform Fire Code Standard 52-1 compressed natural gas (CNG) vehicular fuel systems.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52000, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52400 Chapter 4—CNG compression, storage, and dispensing systems.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52400, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52440 Section 52440.

4-4 Siting.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52440, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52441 Section 52441.

4-4.1 CNG compression, storage, and dispensing shall be located and conducted outdoors or indoors in compliance with 4-4.2 and 4-4.3. Vehicle Fueling Appliances shall be installed per Section 4-17.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52441, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52442 Section 52442.

4-4.2 Outdoors.

4-4.2.1 CNG storage containers charged with CNG not connected for use shall be located outdoors.

4-4.2.2 Weather Protection Shelters. A facility in which CNG compression, storage and dispensing equipment is sheltered by an enclosure of noncombustible materials that has at least 50 percent of the total perimeter area substantially open and a roof designed for ventilation and dispersal of escaped gas shall be regarded as outdoors.

EXCEPTION: Compression equipment located in or under such weather protection shelters may be fully enclosed by noncombustible materials.

4-4.2.3 Compression, storage, and dispensing equipment outdoors shall be located aboveground, not beneath electric power lines or where exposed by their failure, and a minimum of 10 ft (3.0 m) from the nearest important building or line of adjoining property that may be built upon or source of ignition.

4-4.2.4 Compression, storage, and dispensing equipment outdoors shall be located not less than 10 ft (3.0 m) from the nearest public street or sidewalk line and at least 50 ft (15 m) from the nearest rail of any railroad main track.

4-4.2.5 A clear space of at least 3 ft (1 m) shall be provided for access to all valves and fittings of multiple groups of containers.

4-4.2.6 Readily ignitable material shall not be permitted within 10 ft (3 m) of any stationary container.

4-4.2.7 The minimum separation between containers and aboveground tanks containing flammable or combustible liquids shall be 20 ft (6.1 m).

4-4.2.8 During outdoor fueling operations, the point of transfer (see definition) shall be located at least 10 ft (3 m) from any important building, mobile home, public sidewalk, highway, street, or road and at least 3 ft (1 m) from storage containers.

EXCEPTION: At the discretion of the authority having jurisdiction, the point of transfer may be located at a lesser distance from buildings or walls constructed of concrete or masonry materials, but at lease 10 ft (3.0 m) from any building openings.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52442, filed 12/21/94, effective 6/30/95.]

DELETE CHAPTERS 5 AND 6 AND SUBSTITUTE NEW CHAPTERS 5 AND 6 AS FOLLOWS:

WAC 51-35-52500 Chapter 5—Vehicle fueling appliances.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52500, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52510 Section 52510.

5-1 General

5-1.1 Applicability. Vehicle fueling appliances shall be installed, operated and maintained in accordance with this chapter, Uniform Fire Code Article 52, the Mechanical Code and the Plumbing Code.

5-1.2 Permits. For commercial vehicle fueling permits, see Uniform Fire Code Section 105.8, permit m.3.

5-1.3 Maximum flow and pressure. Vehicle fueling appliances shall not exceed a flow rate of 10 standard cubic feet per minute (4.7 L/s) at a discharge pressure of 4,000 psi (27 579 kPa) at NTP. Vehicle fueling appliances used for residential service shall not exceed a flow rate of 5 standard cubic feet per minute(2.4 L/s) at a discharge pressure of 4,000 psi (27 579 kPa) at NTP.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52510, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52520 Section 52520.

5-2 Location and Installation

5-2.1 Residential and commercial vehicle fueling appliances shall be installed outside of buildings. The appliance shall be a minimum of 3 feet (914 mm) from property lines and building openings. When approved by the chief, commercial vehicle fueling appliances may be installed indoors when installed in accordance with Section 5-8.3 and Uniform Fire Code Article 52.

For the purposes of this section, residential shall mean a dwelling as defined in the Uniform Building Code but does not include congregate residences. For the purposes of this section commercial shall not include hotels, apartments, congregate residences and lodging houses.

5-2.2 Anchorage. Vehicle fueling appliances shall be anchored to resist loads in accordance with the Building Code.

5-2.3 Physical and impact protection. Equipment related to the vehicle fueling appliance shall be protected to minimize the possibility of physical damage. When subject to vehicle impact, vehicle fueling appliances shall be provided with vehicular impact protection. See Uniform Fire Code Section 8001.9.3.

5-2.4 Safe functioning of the appliance. The vehicle fueling appliance shall be located to prevent damage resulting from flooding, ice build-up or blockage of ventilation.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52520, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52530 Section 52530.

5-3 Appliance Vent Lines

5-3.1 General. Vehicle fueling appliances shall be provided with an approved method to discharge methane outdoors as the result of the operation of a relief valve or device.

5-3.2 Arrangement. Relief valves or devices shall be provided with an approved means of safely discharging natural gas outside of buildings. The method employed shall be designed such that the design flow capacity of the relief valve or device is not restricted.

5-3.3 Location. Relief valves or devices shall be terminated in accordance with the following minimum requirements:

5-3.3.1 Sources of ignition. Relief valves or devices shall terminate a minimum of 36 inches (914 mm) from sources of ignition.

5-3.3.2 Building openings. Relief valves or devices shall terminate a minimum of 36 inches (914 mm) horizontally and 12 inches (305 mm) vertically above openings or vents into buildings or a space where flammable vapors are likely to accumulate.

5-3.3.3 Paths of egress. Relief valves or devices shall not terminate within 5 feet (1524 mm) of sidewalks or paths of egress.

5-3.4 Termination. Relief valves or devices shall be terminated so as to prevent the entry of water, insects, ice or other materials.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52530, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52540 Section 52540.

5-4 Hoses

5-4.1 General. Hoses used for the supply of natural gas to the vehicle fueling appliances or the dispensing of natural gas into motor vehicles shall be in accordance with this section.

5-4.2 Supply hoses. A single hose having a maximum length of 3 feet (914 mm) is allowed to be used to terminate the natural gas supply into the intake of the vehicle fueling appliance. The hose shall be installed when it is necessary to prevent abrasion damage resulting from vibration at the compressor intake or discharge.

5-4.3 Dispensing hoses. The use of hoses for dispensing of natural gas from a vehicle fueling appliance into a motor vehicle shall be in accordance with the following minimum requirements:

5-4.3.1 Length. The maximum length of the hose shall not exceed 25 feet (7620 mm).

5-4.3.2 Protection. Hoses shall be protected from abrasion, mechanical damage and being driven over.

5-4.3.3 Number of hoses. The number of hoses which may be used for the dispensing of natural gas into motor vehicles shall be in accordance with the appliance's listing.

5-4.3.4 Breakaway protection. The vehicle dispensing hose shall be equipped with a breakaway connection. Operation of the breakaway connection shall stop the flow of natural gas from the vehicle fueling appliance. The maximum force necessary to effect breakaway shall be 40 pounds (18.1 kg) in any horizontal direction.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52540, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52550 Section 52550.

5-5 Signs

5-5.1 General. Signs concerning the safe operation of vehicle fueling appliances shall be provided in accordance with this section.

5-5.2 No smoking. NO SMOKING WITHIN 3 FEET signs shall be provided at the vehicle fueling appliance.

5-5.3 Automobile ignition. TURN OFF IGNITION BEFORE FUELING signs shall be provided at the vehicle fueling appliance.

5-5.4 Electrical disconnect. Approved CNG COMPRESSOR EMERGENCY ELECTRICAL DISCONNECT signs shall be provided at the electrical disconnect switch.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52550, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52560 Section 52560.

5-6 Electrical Disconnect

5-6.1 An emergency electrical disconnect switch shall be provided in an approved location not less than 5 feet (1524 mm) or more than 25 feet (7620 mm) away from the vehicle fueling appliance. The disconnect switch shall be in view of the vehicle fueling appliance.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52560, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52570 Section 52570.

5-7 Gas Supply

5-7.1 Vehicle fueling appliances shall be provided with an approved method of shutting off the supply of natural gas.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52570, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52580 Section 52580.

5-8 Dispensing of CNG

5-8.1 The exterior and interior dispensing of natural gas into motor vehicles shall be in accordance with this section.

5-8.2 Exterior dispensing. The exterior dispensing of natural gas into motor vehicles shall be in accordance with Chapter 5 of this Standard and Uniform Fire Code Article 52.

5-8.3 Interior dispensing. When approved by the chief, the fueling of vehicles inside of buildings shall be in accordance with this section and the following requirements:

5-8.3.1 Mechanical ventilation. The room or area where natural gas is dispensed shall be provided with mechanical ventilation which is designed to not recirculate air. The ventilation system shall terminate outside of the building. The ventilation system shall be designed to provide a minimum ventilation rate of at least 10 times the maximum flow rate of the vehicle fueling appliance.

5-8.3.2 Gas detection. The room or area where natural gas is dispensed shall be provided with a listed gas-detection system. The detector shall be designed to activate an audible and visual alarm when the amount of natural gas exceeds 20 percent of the lower flammability limit for methane.

5-8.3.3 System failure. Failure of the mechanical ventilation system or the gas-detection system shall shut off power to the vehicle fueling appliance.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52580, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52590 Section 52590.

5-9 Maintenance and Inspection

5-9.1 General. Installation and maintenance of vehicle fueling appliances shall be in accordance with the manufacturer's instructions and listings.

5-9.2 Identification. A water-resistant tag, label or other approved means shall be affixed to the vehicle fueling appliance which identifies that the appliance has been serviced in accordance with manufacturer's instructions.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52590, filed 12/21/94, effective 6/30/95.]

WAC 51-35-52600 Chapter 6—Reserved.

[Statutory Authority: Chapter 19.27 RCW. 95-01-125, § 51-35-52600, filed 12/21/94, effective 6/30/95.]